INTRODUCTION

The handwriting is certain visual signs or marks which are accepted by two or more fellowmen or groups or persons or individuals of a town, city or country as a means of communication of informing one’s ideas to other for particular matter or understanding, or sending message to others in a broad sense is known as “Handwriting”. This may includes painting, drawing or embossing. In another words the writing is practically visible speech or talking paper as the Indian says and by all its thousands of peculiarities in combination is the most personal and individual thing that a man does that leaves a record which can be seen and studied (Osborn, 1929).

Handwriting is an applied science consisting of Optics-the science of sight, Physiology-the science of physique and Psychology-the science of mind. All these three are to be combined together for making writing. Our brain is the nerve center and the sensorial impressions are conveyed to it through nervous system. The brain interprets these impressions and instructs the muscles of the hand to contract for producing movements, which through writing materials form the strokes or letters. Thus there is affinity between handwriting and the mind, which sometimes so pronounced that the letters characteristically and apparently show the mind of the writer. While writing our hand has to perform a number of delicate and complex movements involving muscular coordination but it is the brain that transmits signals or results.
The position of our hand is like that of a soldier who holds the arms for striking but cannot strike without the orders of his Officers. Similarly, our hand has to take orders from the brain. The action of writing is, therefore, carried into effect by a voluntary process resulting from coordination of ideas, which cannot be same in two different persons.

The majority population of the world irrespective of their sex is accustomed to write with their right hand, few use their left hand and very rarely a person is ambidextrous i.e. using both their left and right hand for the writing. In cases where a person tries to disguise his writings to deny it later on or for concealing his/her identity, he or she uses his/her unaccustomed hand i.e. right handed persons uses their left hand and left handed persons uses their right hand for writing. The use of unaccustomed hand involves documents in number of civil and criminal cases and those documents include Pronotes, Receipts, Cheques, Agreements, Sale Deeds, Anonymous or Threatening letters etc.

There are some instances where unaccustomed hand is used due to disease injury or amputation of accustomed hand. There are also some problems for the Handwriting Expert when he examine the disputed document written with accustomed hand whether left or right hand and compare disputed writings with the handwritings of suspected persons who had given their specimen writings by using their unaccustomed hand. Thus there is need to identify the characteristic features in determining whether the disputed or specimen document is
prepared by the same person using their left or right hand or not?

When a person uses his unaccustomed hand for writing there always occur change in the writing characteristics as compared to his accustomed hand whether it is a left or right hand. To a layman these changes in the general writing characteristics by using unaccustomed hand might be mistaken for writings of aged or unskilled writer but the study of the individual writing characteristics in the left and right hand of a person will prove the authorship of a person and also distinguish the left and right hand writings.

It may be noted that handwriting is not only a design of letters but also has specific mannerism of writing based on the inner writing characteristics which help to distinguish one handwriting from another and also identify the left and right hand writings.

Thus every person whether he uses his left or right hand for writing has certain identifying characteristic features from which his handedness can be detected.

It is known to the handwriting experts that handwriting of an individual becomes personalized to him as he learns how to start the writing. This is due to the fact that when the child tries to use his newly learned inscription into practical use, he begins to feel annoyed at the slow rate of depiction in following the letter designs of copybook pattern. Thereafter he modifies some of the letters to fasten the production of his writing and makes practices on slate, paper and piece of wood to enhance
the speed. This is noticeable that the beginners hold the pen or pencil gripping them hard with their thumb and fingers, thus they write slowly while putting heavy pressure on the writing instruments, which may have some deviances from the actual models, from which they are copying. The struggle between power to will and power to do plays an important part from the initial and final stage of the development of writing. A person may not able to imitate the designs of the eminent painter's even after many efforts and devoting considerable time to this attempt. This is due to the grasping capacity of the hand which guides the pen for its movement and the measure of co-ordinate action existing between power to will and power to do causes to acquire individuality in the writing which after a continuous practice becomes automatic and developed.

The beginners first conceive a mental picture of the forms of letters, which they wish to reproduce, then try to imitate the same on the paper consciously. After persistent practice the habit of consciousness disappears and unconscious manner of producing developed writing is formed which is described as a reflex action of the mind. It is a fact that a stage approaches when writing is developed but it is equally true that it does so as a pupil of the mind and in the moulding process the significant qualities of the tutor, race and nationality enter unconsciously into the production as it were the mirror of its mind.

At initial stages, the learner endeavours strictly to adhere to the model from which he is being taught; days and days afterwards according to the dictates of his fancy the pupil
acquires habit of unconsciousness. Apart from this in the course of his studies when a student looks at particular letter made in a certain way, which appeals to his aesthetic taste, he begins to imitate it and the very particular form of letters is incorporated in his own handwriting. The peculiar formation of letters of this sort becomes a personal characteristic adopted and developed in the handwriting which combined with his other habitual features serves to identify his writing from that of other individuals.

In the act of writing, the muscular system, the nervous system and the directive functions of the brain are called simultaneously into play. As a physical act, the expenditure of energy is infinitesimal. But the coordination of the muscles of fingers, wrist and forearm must be delicately and sensitively balanced to ensure that within a few hundredths of a second, and within a few hundredths of an inch, the direction of travel of the pen is changed and changed again throughout a bewildering series of motions-and changed, moreover, in a manner at once gradual, even and harmonious. Along with this muscular interaction runs the function of the brain, whose function is two fold. In the composition of the simplest document the brain is primarily occupied with imagery of the thought at the moment being committed to paper and secondarily with the function of local pen control as each individual letter and word is formed. The process is a complex one, the first function being fully conscious and creative one while the second is sub conscious. Due to the fact that every
year an average writer executes each of the commoner letters of the alphabet a countless number of times, this secondary function is semi-automatic. Writing habit derives its individuality and development from operation of the influences of mental monition and muscular formation of the hand and fingers. Due to the differences in the neuromuscular coordination in the different persons a wide range of variations appears in the writing.

The study of the functions and relative capacity of the muscles of the hand, fingers and forearm, their movement and varied coordinate actions in writing will give the investigator an advantage in determining individual habit of writing. As we know that the nature has not produced two things exactly alike, so the functions and the co-ordinate action of the muscles in writing will vary in everybody's writings.

As the writings proceeds, the muscles of the different parts of the body combine, in this process even the muscles of the forearm and whole-arm get involved instead of fingers only. If we hold a pen without moving it to write, the muscles of the fingers and the thumb co-ordinate in holding the pen, if the balance of these muscles is disturbed or loosened the pen is likely to fall. While moving a pen in making curves and strokes we do the process of fluctuating muscular coordination.

The muscular movement is possible through the action of the extensor and the contractor muscles. The contractor muscles are also known as intensor muscles. In making the downward stroke the first and second finger and the thumb is
involved the contractor muscles of the first and to some extent of second finger work along with the extensor muscles of the thumb which assist in keeping the pen in position. The habit of the muscular coordination varies according to the individual habits and no two persons are found possessing actually the same habit. The coordination of muscles is easy to ascertain and has visible effect. It can be determined and described from the manner of the production of curves and straight strokes. Tremors also indicate a peculiar muscular coordination.

**Characteristic Features in Handwriting**

The comparison of unconscious writing habits and critical study of individual characteristics, structure of individual letters and their combinations with each other are used for the identification of the signatures and handwritings. The handwriting is formed of various elements and every element has specific significance in the process of comparison, though their importance may be different in different writings.

The handwriting experts are frequently required to give the opinion that the writings under examination are written by the same person or by different. Therefore, he must have studied the sufficient number of identifying characteristics in both the sets of writings and those similarities must preclude any chance of coincidence with the writings of any other individual. Similarly in order to form an opinion that two writings were written by two different individuals, there should exists the dissimilarities.
The handwritings are not compared by mechanical methods rather they are compared on the basis of detailed observations and scientific evaluation of those observations in the light of basic identification rules and expertise. The several characteristic features which go to establish a personal writing habits may comprise of writing movement, writing skill, line quality, writing slant, writing speed, spacing, size and proportions, style of writing, pen pressure, shading, pen positioning, quality of strokes, alignment, arrangement, formation etc which produce a particular form of writing. All these characteristics are general writing characteristics. Individual writing characteristics are more or less peculiar to a specific writer.

**General Writing Characteristics:**

**Arrangement:** The habit of arrangement of words, sentences and paragraphs in writing is the outcome of several reasons such as artistic ability, education, environment and the degree of expression of certain mental traits etc. This habit is consciously acquired at the initial stage but when it is fully developed, it becomes automatic and it is considered as one of the fixed and important writing habits. Just as arrangement of strokes and curves give shape to a letter, so the arrangement of letters and words and the method of writing a sentence with regard to size and spacing produce an important factor for examiner to compare handwritings and determine their identity or non-identity. The examination of arrangement involves the general arrangement of writings on a paper and style of
paragraphing, spacing between letters, words, lines and paragraphs, nature of alignment of lines whether even, uphill or downhill, irregular or arched, placement of signatures with respect to writings, nature of margins etc. at left, at right, at top and at bottom of paper, location of punctuation marks with respect to the base line, relation of capital letters with regards to small letters, arrangement of headings with reference to the body of paragraph.

Alignment: The relation of the letters of word, signature or written line to an actual or imaginary base line is referred to as alignment. The alignment may be even, arched, garlanded, irregular, ascending or descending depending mainly upon the position of writing arm with respect to line of writing, movement employed and the individual habit of the writer. If the alignment is straight across the paper, it is considered that the arm is placed at right angles and the elbow is used as pivot of writing. Those who write with wrist movement the alignment is likely to assume the formation of arcs so far as the pen scope permits. When the position of the arm and the paper is not at right angles but remains in opposite directions to the right or left side, the alignment of writing will be uneven throughout. Some individuals are in the habit of writing certain letters in their signatures at higher or lower position as compared to the other letters and in some writings it is found that the writer writes evenly in a surprising manner across the whole length of paper having no printed lines. In some writings and signatures the nature of alignment is so characteristic that it becomes a
strong corroborative factors along with other points of similarities. Some persons are in the habit of forming letters in peculiar type. They sometimes increase or decrease the height or length of letter according to their aesthetic taste appeal and thus the characteristics so formed sometimes produce an uneven or irregular line. Alignment of writing or signatures may be classed as Ascending, descending, even, arched, garlanded and irregular.

The line of writing which has a tendency of rising upward is called ascending alignment and the line of writing or signature which descends is called descending alignment. The alignment which regularly proceeds straight is called even alignment. In some writings/signatures, when the letters do not show fixed positioning i.e. when some of the letters ascend and /or some of letters descend, the alignment is called irregular alignment. In the writings/signatures, when the letters are positioned in such a manner that they form are like formation with the actual or imaginary base line, the alignment is called arched alignment and when the letters are positioned to form through like formation, the alignment is known as garlanded alignment.

Relative Sizes And Proportions: Although the overall size of writing may increase or decrease but the habit in regard to the relative size of one letter to the other letters is almost a fixed habit and it remains fairly constant. Even in disguised writings showing intentional increase or decrease in the size, the proportions of letters have been found to be corresponding with
the proportions in the normal writings of the writer. Some writers are in the habit of writing some letters abnormally longer or shorter than the other letters and such habit remains persistent even under different sets of circumstances. The writing proportions are: Relative heights of letters, proportion of the height and width of the same letter and Proportion of height of letters to the length of the word.

There are two methods to determine proportions of letters. The first method is to measure each and every letter and to mathematically calculate their proportions. This method is cumbersome and it has many disadvantages. The second method is to observe the ratio of letters under ruled squares of transparent medium such as glass or celluloid etc. and to photograph them for demonstration purpose. This method is more suitable because the observations can be demonstrated and these can be easily studied and understood.

*Writing Slant:* The inclination of letters or their strokes with the actual or imaginary base line is known as writing slant. The importance and role of this writing habit in comparison of writings vary from person to person, however with many writers it is one of the most fixed writing habit that becomes highly important under certain conditions. Since the change of writing slant results in marked difference in the appearance of writing, therefore, most favorable and common disguise in Court specimen writings and Anonymous letters is a change in the slant. In disguised writings, a person who normally writes with certain degree of slant towards right of the vertical may
change the slant to the left of the vertical and vice versa. If writings are more, then some of the lines may show slant to the right side and sometimes may show slant to the left side and again a sudden reversion to normal writing slant. To determine whether the differences in the writing slant in two sets of writings is due to disguise or due to their non-identity is rather a simple task based on some established principles. Such as, when the difference in slant in two writings of considerable length is slight i.e. not more than 10-15 degrees and this difference is persistent or consistently maintained then this point towards the non-identity of writings and not disguise. A deliberate change in the writing slant with an intention to repudiate identity cannot be maintained in the writings of considerable length and the writer generally reverts to his normal writing slant. Experiments show that when a person intentionally changes his writing slant to conceal identity or for other reasons, it is highly improbable that he would change the slant in the tune of 10 to 15 degrees rather he would be tempted to change it in a marked manner by thinking that more the change in slant more it will be difficult to identify the writings.

A correct interpretation of this habit may also prove very useful in cases of fraudulent additions and alterations because the preparatory may not be able to align the writing slant of added writings or figures with the original writings or figures or he may not be conscious of the fact that the slight changes in the writing slant of the added writings may cause major changes in the fate of the case. The signature of some
individuals may show peculiar writing slant i.e. most of the letters are slanted in one direction and one or two letters are slanted in the opposite direction. If this writing characteristic is persistent, it has strong identifying value.

**Size:** Size of writing may vary from person to person. In some writings or signatures this habit may have but little importance, whereas, in some writings or signatures, the size of the letters and strokes in writings or signatures may play a significant role in determining their genuineness or otherwise e.g. in case of traced forgeries the agreement in sizes of letters in the traced signature and model signature or in two or more traced signatures interse may provide a strong evidence of their un genuineness. The size of writing may vary due to the internal as well as external circumstances at the time of writing. The writer may reduce the size of writing according to the available space for writing. The writings of alcoholics tend to increase in size and similarly if a person is in haste, he or she is likely to increase the size of letters. In most of the disguised writings, the writer’s tendency is to change the size of his writing, which is mostly increased and rarely decreased. The size may be classified as larger, medium, small, irregular or in combinations.

**Movement:** The manner in which the fingers, hand, forearm or whole-arm move to produce writing is called writing movement or movement in writing. The movement employed in the formation of letters, figures and words are classified in the following classes on the basis of the fulcrum used are: finger
movement, wrist movement, forearm movement, whole-arm movement and their various combinations.

**Finger Movement**: This movement is generally employed by the persons who are not very familiar with the writing process or the forgers who forge the signatures by carefully drawing the outlines of letters or the persons who in order to disguise write with their unaccustomed hand. In finger movement, the action of thumb, first and second fingers form the letters. The hand and arm remaining inactive except for lateral motion. The finger movement is the initial movement in writing and it is classed as poor movement due to the excessive grip and concentration on the writing instrument. The writings written with finger movement usually show lower order of writing skill and sometimes labored and drawn movement lacking rhythm and fluency. Lack of clear cut smooth strokes and presence of broad curves, Irregular curves and ill-defined connections between letters, Irregular or heavy pen pressure and slow writing speed, Unsymmetrical letter formations and blunt beginning and ending strokes and very little lateral freedom in the strokes.

**Wrist Movement**: The action of hand as a whole and fingers produce writings with the wrist movement with wrist as pivot or center of motion. The writings with wrist movement usually show fair degree of writing speed and fine edges of strokes, Angular connections at the tops and bottoms of letters and narrow curves. Usually tapering terminals of letters, uneven alignment with ascending tendency and well-defined curves and
smooth connections. The majority of the individuals employ this type of movement.

**Forearm Movement:** Those who have a higher degree of muscular coordination and command over the writing instrument employ this type of movement. The movement of hand and arm with the elbow resting on the table as the center of motion is known as forearm movement. Some superior penmen write entirely with forearm movement without any separate action of the fingers and hand, however, generally the forearm movement is used in combination with the action of hand and fingers. Forearm movement when combined with the action of the finger and wrist movement produces clear round and oval handwriting. The arm increases the degree of speed and the fingers and thumb produce legible forms of letters. The writer employing this movement can write continuously for hours without being tired and they can write complete lines across the page without changing the pivot. The writings produced with forearm movement usually portray well defined formation of letters and higher order of writing skill, clear cut symmetrical strokes, rapid writing speed, uniform base line, sharp and clear cur edges of strokes, flying starts and tapering terminals and fine and graduated pen pressure and shading.

**Whole-arm Movement:** Whole-arm writing movement is the action of arm without any resting point or pivot. This class of writing movement produces longer and embellished strokes and it is generally employed in forming capital letters of large size.
in black board writings and in very large writings written by artists on sign boards etc.

It should be noted that the person who is habitual to write with finger movement couldn’t adopt the higher movement i.e. wrist movement, forearm movement or the whole arm movement. However, the writer of higher movement may descend to lower movement in some special circumstances as in case of disguise. Therefore, it is not possible for the writer of finger movement to forge the writings or signatures written with wrist or forearm movement. The writer of forearm or wrist movement may descend to lower movement for making forgery of writings written with finger movement and in case of disguise also. These movements may be employed in various combinations such as finger-cum-wrist movement, wrist-cum-forearm movement etc.

**Spacing:** The spacing habit of a writer in his signatures and writings can be studied in three manners i.e. space between the letters, space between the words and space between the writing lines. The habit of leaving space between letters, words and lines cannot be the same in the writings of different individuals and some times this habit may prove useful in the detection of forgery. In cases where the signature or thumb impression is fraudulently obtained on a blank paper and the body writing is written or typed above that signature or thumb impression to make a document, it is normally not practically possible to adjust the matter of the body writing in the available space above the signature or thumb impression and the preparatory
has to increase or decrease the spacing between letters, words, lines or paragraphs according to available space. In these type of fraudulent documents bearing genuine signatures or thumb impressions the spacing may play a significant role and this factor may be sufficient to prove that the document is not genuine. In case of fraudulent additions, alterations or interlineations, the added matter may not be properly adjusted in the original writings and the inconsistencies in the spacing may at once reveal the fraud.

**Pen Pressure:** The pen pressure may be defined as the force or pressure applied on the writing instrument during writing operation. The acquisition of the habit of pen pressure is automatic and unconscious. This writing’s characteristic is one of the most fixed and personal habits and it infuses life to writing. The more graded pen pressure the more fine and graceful is the writing. Pen pressure in a signature or writing can be seldom simulated by the forger at the exact locations and in correct degree due to the reasons that firstly a forger normally does not give attention to such a minute and hidden characteristic and secondly it is beyond the powers of a forger to apply similar pressure on the writing instrument and give similar emphasis at certain points which are employed by the actual writer by virtue of his habit acquired by long practice and individual taste.

“One of the most personal but somewhat hidden characteristic of writing is that which for want of a better term is described as pen pressure. The weight of hand, gradation of
pressure and placing of emphasis radically change the appearance of writing as a whole without changing the form. These delicate characteristics almost baffle simulation and when properly exemplified are always among the strongest evidences of genuineness" (Osborn, 1929).

Pen pressure can be classified into Light Pen Pressure, Heavy Pen Pressure, Medium Pen Pressure and Graduated pen Pressure.

The application of light pen pressure produces fine strokes and skilled writers having good muscular co-ordination and command over the writing instrument generally apply this type of writing pressure. The light pen pressure in writing is usually accompanied by fast speed and well-defined curves. The children generally apply the heavy pen pressure in the initial stages of learning to write, by illiterates, by forgers and by the persons for whom the act of writing becomes a difficult task due to one or the other reason such as use of unaccustomed hand. The application of heavy pressure results in slowing of speed, broad strokes, heavy shading, blunt starts and blunt terminals. The heavy pen pressure may also cause indentations in the paper if writing support is not too hard. The degree of pen pressure, which lies in between the light, and heavy pen pressure is referred to as medium pen pressure. The well skilled writers sometimes employ graduated pen pressure to produce fluent and rhythmic writings. In such writings the pen pressure is well graduated in harmonious manner according to the individual taste of the writer. The degree of pen pressure is
judged from the width of strokes and its thorough examination may help a lot to determine genuineness or otherwise have a signature or writing. In forged writings, since the main motive of the forger is to copy the design of letters or other glaring features, therefore while drawing the strokes, he does not usually care for the relative width of strokes at different places or for the pressure applied in the formation of letters and he may produce the strokes with varying and inconsistent pen pressure. He may even retouch some strokes in a careful manner to make some strokes look broader than the others. Once such minute details are found to be non-identical, which cannot be explained logically, the proving of forgery is simplified.

**Shading:** The variations in the width of strokes are known as shading. Shading is considered to be the visual record of the manner in which the pen was moved on the paper i.e. the angle at which the pen was held with respect to the writing surface and with respect to the line of writing, pen pressure applied and the emphasis of the pen at particular points. Since shading depend upon other hidden writing characteristics of the writer, therefore, it is most individualized and important element of handwriting which cannot be simulated or copied unless the forger first acquires all the other related habits which is practically impossible. Shading gives grace to the writings.

The letters having well graduated shading appear more lively and pleasing than the letters portraying rough or irregular shading. Shading habit is an involuntary act personal to each
writer, resulting from his individualized habit of holding the pen at certain angle, applying pen pressure and twisting the pen at curves according to his ability and taste. Some writers shade all the strokes in a smooth manner, some writers shade the strokes in an artistic manner with well graduated application of pen pressure, some writers shade the initial parts of the strokes while others are in the habit of shading lateral parts of strokes. The shading may be smooth, graduated, rough and irregular, heavy, explosive or bunchy, rare or accidental.

**Writing Speed:** The writing speed cannot be determined/measured with the help of an instrument rather it is judged from the nature of strokes by keen observations and guiding principles. The speed is directly related with the movement i.e. higher the degree of writing movement the greater is the writing speed unless writing speed is deliberately changed in disguised writings or it gets affected at the time of forging the signature or writing. Since writing speed may get affected by external as well as internal factors such as nature of writing instrument, quality of paper, available space for writing, health of writer, posture of writer etc., therefore some variations in this writing habits in two sets of writings may occur. Generally the writings or signatures written in slow speed can be easily distinguished from those writings or signatures written in fast speed, however these principles may be useful in ascertaining the speed. Such as writings portraying heavy pen pressure, blunt starts, blunt terminals and pen lifts indicate slow speed, well defined rhythmic strokes and tapering terminals
indicate fast speed, the presence of tremors, retouching and pen pauses in the strokes show slow speed and the presence of abbreviating tendency in the letters, connected letters and rounded strokes indicate fast speed.

**Pen Position:** The pen position is the position or angle of pen with respect to writing surface as well as with respect to the line or direction of writing. The manner and angle of holding the pen are the most individualized and fixed writing habits and can neither be easily disguised nor copied or simulated.

The reason for the first assertion is that the manner of holding the pen becomes so fixed and the writer becomes so accustomed to hold the pen at a particular angle that it becomes most difficult if not impossible for him to leave this habit and adopt a new style of holding the pen in a different manner at different angle. The second assertion is based on the simple reasoning that the forger does not understand the significance of the manner of holding the pen and he cannot assess and then adopt this writing habit of another person by discarding his own fixed and individualized habit of holding the pen.

The different writers hold the pen at different angles varying from almost vertical to ten to fifteen degrees from the writing surface. When the pen is held in vertical position, it produces fine thin lines of uniform width, the shading is very less or almost negligible and the strokes are lifeless and sometimes scratchy. When the pen is held at a low angle, it produces broad strokes and heavy shading. The angle of pen with respect to the surface of the paper can be roughly
determined by studying the nature and extent of shading in the strokes. Moving an unlinked pen (having similar width of nib point) over the strokes by adjusting its angle according to the location of shading may prove useful in this attempt. It is comparatively easier to determine pen position with respect to the direction of writing i.e. whether the pen was held parallel to vertical strokes pointing towards the writer or whether the pen was held parallel to the writing line or at a position between these two directions. When the pen is held at an angle parallel with the vertical stroke, the downward strokes show shading whereas the lateral or horizontal strokes are thinner and mostly devoid of any shading. When the pen is held parallel with the direction of line the horizontal or lateral strokes show shading whereas the downward strokes are unshaded thin lines. If the pen is held in between these two positions, the location of shading changes accordingly. The angle of pen with respect to the direction of line is assessed from the location of shading and by moving an unlinked pen over the strokes in similar manner as it is done for the determination of angle with respect to writing surface.

Some writers put comparatively more pressure on left nib point, others on right nib point while others exert uniform pressure on both the nibs’ points at the time of writing. This habit of putting pressure on nib points also has some significance in the comparison of writings and signatures. When the pressure is almost equal on both the nib points, the margins of strokes are uniform and the strokes are smooth.
When the pressure on the left nib point is comparatively more, the up strokes may be more shaded than the down strokes and the right margin of the line tends to be more indented and rough. If comparatively more pressure is applied on the right point of the nib, the up strokes are lesser shaded than the down strokes.

The ballpoint pen has a hard non-flexible writing tip i.e. a small rotating ball, which rolls the ink on the surface of the paper. The rotating of the ball tends to produce a small depression in the center of strokes and when a weak pressure is applied on a ballpoint pen, only the tip of the ball touches the paper producing a narrow stroke. When one writes with heavy pressure and the writing support is not too hard, the ball depresses the paper and its major portion comes in contact with the paper thereby producing wide stroke. It means that when the nature of writing support and other factors are same, the width of the strokes is directly proportional to the pressure applied on the pen.

The shading in ballpoint pen writings caused by the variation in the pen pressure is not so pronounced as it is in fountain pen writings.

"The non flexible quality of the ball point should produce a handwriting devoid of shading or evidence of pen emphasis. This is not entirely the case. Granted the pen gives a more uniform width line, but some writers can nevertheless produce handwriting with ball point pen which reveals clearly
differences in writing pressure.” Since the writing i.e. the ball of a ballpoint pen is rounded, therefore the angle of pen does not seem to cause any appreciable change in the nature of strokes; hence the pen position cannot be correctly determined in ballpoint pen writings (Hilton, 1982).

**Style:** The style may be classified as linear, oval, round, angular and square with their combinations. Style depends upon the movement employed by the writer. Some writers have more or less a fixed habit of forming the connections of the letters in their writings. Such as the writing which consists of vertical and horizontal lines and which is employed in writing telegrams, labels and envelopes is called linear style of writing. This writing can be easily produced with the combined action of the fingers and wrist as in Devnagri script. Rounded or circular styles are produced by the combination of forearm and finger movement as in Telugu, Malayalam scripts. Writings having narrow and angular connections are the product of wrist movement as in Modi and Sindhi scripts. Square style is the combination of the oval and square as in Gurmukhi and Bengali scripts.

**Pen Scope:** It is the distance traveled by the pen from one point to other point without changing the pivot. It largely depends upon the lateral freedom of writing instrument with respect to pivot. In finger movement, hardly one stroke or letter can be written without shifting the pivot, therefore the pen scope is very limited. In forearm movement the distance between the writing instrument and pivot is more and there is more lateral freedom, therefore the pen scope remains very extended. In
examining writings, the number of letters written in one operation without lifting the pen and changing the pivot should be counted which might provide a corroborative factor regarding their identity or non-identity.

**Tremor:** The unusual departures of the line from its intended course may be termed as tremors, which may be natural or artificial. Tremors may appear in the handwriting and signatures due to several causes such as old age, sickness and infirmity, weakness of sight, illiteracy, forgery and attempt to disguise etc. Natural tremors due to old age or weakness etc. clearly show muscular weakness and writing movement beyond the control of the writer. Presence of sudden departures in the line, abrupt recoveries and other irregularities are main indications of natural tremors. Even some parts of a letter or letters itself may be omitted and no attempt is made to correct them. The Un-natural tremors due to forgery does not show uniformity i.e. some of the strokes are too strong and fluent whereas some of the strokes show hesitations and wrongly placed tremors; even sometimes the forged signatures purporting to be written by an old person show minute retouchings and overwritings. The tremor of illiteracy shows general irregularities owing to hesitation, uncertainty and unfamiliarity with the writing process. Unsymmetrical strokes in writings, irregular alignment, abnormally larger or smaller letters, absence of skill and rhythm are the important features.

**Retouchings:** Sometimes genuine signatures or writings are retouched to correct the palpable defect or to make certain parts
of letters legible. The writings of elderly persons may show
frequent retouching due to their inability to move the pen
properly and in certain rare cases a skilled writer due to his
peculiar habit show retouchings. When a forger tries to forge a
signature by process of tracing from a model signature or by
simulating the design of letters his main attempt is to make the
outline of forged signature similar to the model signature
selected by him. In this attempt he may be able to copy the
design of letters but the imitation of writing habits and
individual writing characteristics is beyond his power. In the
zeal to perfect the job, the forger may retouch and patch up the
strokes in a very careful manner with an intention to conceal the
retouching and avoid detection. The main demarcating line
between the genuine and fraudulent retouching is that the
genuine retouching are always made carelessly in a bold
manner while the fraudulent retouchings are always made in a
careful, concealed and suspicious manner.

Skill And Penmanship: The skill and ability of imitating
another person's signature greatly differ from person to person.
No forger can successfully imitate the handwriting or signatures
of a person who is comparatively more skilled than the forger
himself, because an individual cannot exercise better
penmanship than he actually possess. The writer employing
lower writing movement cannot ascend to higher movement i.e.
an illiterate person cannot attempt to successfully imitate the
superior style of writing though a skilled penman may simulate
the signatures of an illiterate person. If the disputed signature
displays better penmanship than the genuine normal signature, it will conclusively establish that the disputed signature is a forged signature.

**Line Quality:** The term line quality refers to the character and quality of lines or strokes in writing or signatures which portray how the pen was moved, where the pen paused or stopped, deviations from intended path, writing pressure employed, presence or absence of tremors, hesitations, writing speed or the fluency and rhythm with which it was drawn. All these factors are very important factors and play an important role in the determination of genuineness or otherwise of the signatures or writing. If the strokes are showing laboured and drawn nature of writing or exhibiting unusual pen lifts, pen pauses, retouchings, unnatural tremors, hesitations or restricted nature of speed, they indicate that the writing is not written in normal and natural manner and the line quality is poor. A developed writing produced by a skilled person having good muscular coordination will show clear cut and smooth line quality, well defined curves, fast speed and rhythm, continuity in movement without any unnatural pen lifts, tremors or pen pauses etc.

**Individual Writing Characteristics:**

The individual writing characteristics are highly peculiar to an individual. The identification of a writing through the process of comparison of the forms of letters and by an analysis of their general writing characteristics really amounts to noting the individual writing characteristics in the handwriting of a person. If the similar individual writing characteristics are
present in two sets of handwritings then these handwritings can said to be written by one and the same person but if there is difference of individual writing characteristics in two sets of handwritings then these handwritings can said to be written by different persons.

The individual writing characteristics in the signatures and writings are in the form of beginning of the letters and strokes, turnings in the body of the letters and strokes, curves at the top, bottom and in the body parts of the letters and strokes, junctions of the letters and strokes, eyelets present in the letters and strokes, connection of strokes whether written continuously in one pen operation or with more than one pen operation, retracings in the beginning, bottom and body parts of the letters and strokes, staffs of the letters whether straight, curved or slanting, lines which may be top lines or base lines such as embellishments, loops in the body of the letters and strokes and terminals of the letters whether left or right down slanting, straight or vertical, etc. All these individual writing characteristics depends upon the formation of letters and strokes developed by the individual and can never be same with regard to its manner of execution in comparison with the individual characteristics of different individuals.

**Natural Variations:** The human hand does not work like a mechanical device and the handwriting and signatures of the same individual show some variations due to internal or external factors which are natural and it is not a conscious or sub conscious act. But, it should be noted that such variations
always occur within certain well-defined limits. There may be
divergences of varying degrees or of varying forms in the
writing of different persons but the unmistakable distinctive
feature of marked individuality cannot be found to have been
spoiled by such variation. Every individual has its range of
natural variations in the signature of writings and normally he
cannot cross that range while signing or writing. While in case
of disguise the sphere of the range of natural variation becomes
wider. The basic principle of handwriting comparison is that the
handwriting habit of an individual once reached to maturity
becomes a permanent and unconscious habit and the variations
found in it are always superficial in nature. It is a matter of
common experience and observations that the genuine
signatures and handwritings of an individual vary to an extent
according to habit, circumstances and conditions under which
they are written. Even if a person writes a number of signatures
at the same time and in the same sitting, some natural variations
must occur in the form of letters and other features. The
presence of natural variations in writings and signatures is a
strong indication of their genuineness. Once the two signatures
or writings are found to be having exact size and proportions,
then one of them or both of them must be the forged signature
or writing. There are certain causes by which a person’s
handwriting may be affected. The condition of health, mood of
mind, hesitation or haste, condition or quality of pen, ink and
paper etc. i.e. variations due to old age and illness, variations
due to weakness of sight, variations due to disguise, variation
due to alcohol consumption, variations due to writing instruments etc.

**Disguise:** Disguise is an intentional alteration of the appearance of handwriting or signatures to conceal natural writing to defy identification. The disguise may also be defined as an alteration of the appearance of writings by assuming another style to conceal the normal writing style. The effort of the writer is directed to hide his personal characteristics and to adopt the characteristics foreign to his own. It is generally found that in some cases defendants deny the authenticity of their genuine signatures on the Pronotes and Receipts signed by them. When they are asked to give specimens of their handwriting for the purposes of comparison with the signatures in dispute, in majority of cases such persons disguise or attempt to disguise the forms and pictorial effects of the letters more or less according to their capacity or dexterity. Sometimes, moneylenders bring forward forged documents and attempt to prove that the differences in signatures are due to the defendant’s conscious effort to disguise at the time of signing the pronote. Most of the Anonymous letters are the result of disguise. Common features of disguise are: writing is larger or smaller in size than the normal writing, writing is written in slower or faster speed than the speed of normal writing, change in the direction of writing slant or slope to reverse direction, introduction of grotesque letter forms, addition of embellishments, display of inferior skill, lack of consistency within the writing, abnormally heavy pressure, overwritings and
retouchings showing conflict in the mind of writer, introduction of artificial tremor, introduction of capital letters instead of small letters, change in spellings, change in the hand i.e. written with unaccustomed hand, lesser fluency and poorer rhythm than normal writing, change in alignment, readapt ion of previous writing forms of letters i.e. copy book pattern, attempt to copy the handwriting of another person. assumed illiteracy, introduction of different letter designs etc. It is not only difficult but also impossible for an individual to materially change the writing habits.