INTRODUCTION
The Muslims of the early period had great interest in almost all the fields of learning. They made remarkable contributions in every field of knowledge under the Umayyads and the Abbasids. The Muslims of Spain in similar fashion carved out for themselves a place in their contribution to knowledge at par with their brethren in the other parts of the Islamic world.

Different sciences such as mathematics, medicine, botany, astronomy, geography, alchemy and others were important subjects which were studied and developed by them along with other subjects of religious sciences such as history, Quran, hadith, fiqh, tafsir etc. For quite a long period Spain remained an important seat of learning. These sciences became essential for the Muslims soon after the emergence of Islam for the performance of many important religious duties. Although it is more related to mathematics the words of Mushtaq and Tan state:

Besides the performance of some of the fundamental duties of Islamic faith was near to impossible without scientific knowledge, and in particular, knowledge of Mathematics. Fasting, pilgrimage and numerous other religious ceremonies

required careful and scientific understanding of the lunar calendar. Zakat, the laws of inheritance and waqf (religious endowments) are purely in need of mathematics. Without the knowledge of mathematics one can not reach to a fixed result regarding these religious duties.

Therefore, Islam from its very beginning teaches its believers to seek knowledge. The first word of the revelation Iqra' (read) is a great pointer towards seeking of knowledge. Muslims are encouraged by Allah and Prophet Muhammad (peace be upon him) through Quran and hadith for seeking knowledge. As the Quran says, "Allah will exalt those who believe and those who are given knowledge to high degrees" (LVIII:11). Their attention are also diverted towards the study of sky and earth to find proof to their faith. Similarly it is said, "Whoever is given knowledge is indeed given abundant wealth" (II:269).

The importance of knowledge may be recognized from the fact that it occurs at least 750 times in the Quran and is indicated at numerous places directly or indirectly through various words like 'understanding', 'remembering', 'thinking', 'reasoning', etc.

The importance of knowledge is also proved by the tradition of the Prophet Muhammad (p.b.u.h.). According to various traditions, he himself prayed for knowledge as "My Lord, increase me in knowledge". He directed the believers to "seek knowledge from the cradle to the grave, no matter
if their search took them as far afield as China". The status of knowledge was so much high ranked that it was told "He who travel in search of knowledge travel along God's path of paradise", "the ink of scholars is worth more than the blood of martyrs" and "to listen to instructions of science and learning for one hour is more meritorious than attending the funerals of a thousand martyrs - more meritorious than standing up in prayer for a thousand nights". Muslims were bound to seek knowledge as the Prophet Muhammad (p.b.u.h.) said, "Seeking of knowledge is obligatory upon every Muslim". Many other traditions of the prophet Muhammad (p.u.b.h.) emphasised on getting and teaching knowledge. In Bukhari it is mentioned that the downfall of a nation is sure if it gives up the acquisition of knowledge.

Therefore to follow Quran and the sayings of the prophet Muhammad (p.b.u.h.), Muslims required knowledge through various means. A number of Muslim scholars performed a marvellous job either independently or under patronage of the rulers. Throughout the four centuries (8th to 11th century A.D.) or even more the scientific learning by the Muslims reached its height as and when they first translated the scientific works obtained from various parts of the world, wrote commentaries and summaries and then developed them.
Different sciences were the need of Muslims for either in the performance of their religious duties, for the welfare of the mankind or the spread of their religious, culture and civilization. Arithmetic, geometry, plane and spherical trigonometry and algebra were the branches of mathematics, cartography, cosmography and travel writings belonged to geography and surgery, medicine, pharmachology and others were the branches of medical science on which Muslims of Spain paid their attention. They worked and developed almost all these branches to their height.

As far as mathematical science is concerned arithmetic is supposed to be the branch of mathematics which was studied by man before all learnings and even before written language came into existence which seems to be obvious because he, first of all was needed to count when he saw different objects, required to add one to the other, subtract and divide them into different classes. Arithmetic, therefore, 'is the concept of numbers and operations on numbers'. Geometry, as the word itself shows, is the science of earth measurement ('geo' means 'earth' and 'metre' means 'measurement'). So according to A.A. al-Daffa', "Geometry is a science which not only leads to the study of the properties of space, but also deals with the measurement of magnitude". According to its need, this

2. 'Ali 'Abdullah al-Daffa', The Muslim Contribution to Mathematics, p.82.
science has length, width and height as its three dimensions which help in measurement, especially in the measurement of earth. Similarly trigonometry is another branch of mathematics which is 'the science of angles'. As is obvious from the word 'trigonometry', it has its three parts: 'tri', 'gonon', and 'metria' which have the meanings 'three', 'angle', and 'measurement' respectively. This branch of mathematics may also be regarded to deal with the measurement and calculation of the sides and angles of a triangle.

Algebra is 'the science of generalization of arithmetic'. It may also be defined as "that branch of mathematical analysis which reasons about quantities using letters to symbolize them". For example if $x$ is any number then $x+x+x+x+x = 5x$

The medical science relates to the welfare of mankind. It deals with those branches which supplies the knowledge to cure the diseases of all parts of the body from head to foot and hygiene also. In the treatment, the simple and compound medicaments are used. The diets and the exercise are also discussed so far the hygiene is concerned. Various diets are also used in the treatment of patients as per their usage. The pharmacology is the science of preparation of the drugs, either in simple or compound form. Some herbalists have also been worked as the
pharmacists. It needs a careful consideration while preparing the medicines together with the consideration in the combination and of the ratio of different drugs. Surgery seems to be necessary for the healing of wounds, treatment of fractured bones and other related things.

The geographical science is also composed of various branches. Cosmography, one from amongst them, is the science of the description of the world including the race, colour and creed of the people living in different parts of the world, their culture, civilization and customs and other related facts of the people, land and environment. Cartography is the science of map making under which the maps of either the whole world or of different areas of the world are made. These maps are drawn according to the boundaries of the countries and continents, showing with them the islands, the rivers, seas and the oceans; the mountains and deserts; and the glaciers and the lakes. Travel account (Rihla) is also an important branch of geography in which the geographers or the travellers use to write the accounts of their travels. They describe what they had observed in their travels viz the people, the land, the culture, the races, the atmosphere, the crops and others.

Astronomy, like other sciences is a separate science that deals with the study of the Universe, comprising the
countless suns, moons, stars, planets, galaxies, constellations and their movements. This science is also much necessary for the performance of religious duties for the Muslim: Likewise, the arising, moving and setting of the sun indicates the time to perform the ritual prayer. Similarly the months of fasting and of performing the pilgrimage depend upon the visibility of new moon. This science always becomes helpful to find out the direction of the journeys in the night. With the position of the stars one becomes able to fix the direction for his journeys.

Agronomy, as is obvious from its name, is the science of agriculture. It deals with the study of growing the plants, trees, crops and other related things like, the kind of soil, the atmosphere for the plantation of some particular area.

It is also worthy of mention that the complete introduction and background each science is discussed under chapter.

Muslim Spain also produced a number of Muslim scientists who started, their activities in these fields from almost the middle of the 10th century A.D. and continued their endeavours till the fall of Muslim rule in the country in 1492 A.D. The exact number of the scholars produced by Muslim Spain and their contributions may never be known as a huge material of historical importance was destroyed by the Christian rulers of Spain who succeeded the Muslims.
It is worthy of note that the role of Islam and its civilization in Spain is most significant and Muslims contributed in all the aspects of life throughout their rule of about eight hundred years. They had been wellknown in writing books on different topics, viz., history, biography, geography, agriculture, chemistry, botany, physics, medicine, and mathematics alongwith all their branches in arithmetic, geometry, algebra, trigonometry, surgery, pharmacy, as well as astronomy, music, poetry, prose and religious sciences as Quran, hadith, fiqh and tafsir.

In the 10th and 11th centuries A.D. Muslim learning in the country reached its zenith, schools and libraries were founded in the 10th century A.D. Sedgwick and Tyler quote Hume (pp. 102 and 109) as:

...the schools and the libraries were famous throughout the world; Science and learning were cultivated and taught as never had been before. Jews and Muslims, in the friendly rivalry of letters, made their country illustrius for all times by the production of their study ... The schools of Cardova, Toledo, Seville and Saragossa attained a celebrity which subsequently attracted to them students from all parts of the world.

thousands of schools and colleges were running and thousands of teachers were teaching during the Muslim rule in Spain. In the 12th century A.D. there were one thousand schools

and colleges and more than ten thousand teachers in Cardova (Qartaba) only, and some of the scholars wrote hundred or more books and created great inventions of science.\textsuperscript{4} The Universities of Granada (Gharnata) Valensia (Blansia), Cardova, Seville (Ishbilia) and Toledo (Talitala) were the great centres of learning. Spain is the scene through which almost all the works may they be of the Arabs, the Greeks or the Hindus were transmitted to Europe.

It has the fertilized soil which produced a number of great scholars in various fields. Al-Qali (901-967 A.D.), a professor of Cardova University was one of the great scholars. Al-Zubaydi (928-89 A.D.) of Seville and al Suyuti were among those who were grammerians and linguists. The field of literature produced a great man, Ibn 'Abd-Rabbih (860-940 A.D.) at Cardova. Ibn Hazm (994-1064 A.D.) belonged to the group of great thinkers. Ibn Zaydun (1003-1071 A.D.) contributed to the field of poetry. Ibn Khaldun (1332-1406 A.D.) and ibn al-Khatib (1313-1374 A.D.) were such great historians whose works are still the guides for the purpose of research in the field of historiography. Al-Idrisi (1099-1166 A.D.) was one of the many great geographers in the Muslim world. Ibn Zuhr (1091/94 - 1162 A.D.) and ibn Zahrawi (d. 1013 A.D.) were two great

\textsuperscript{4} Rashid Akhtar Nadvi, (nd), Musalman Andalus Mayn, p.746.
surgeons and al-Ghafiqi was famous as a botanist. Similarly, ibn Rushd (1126-1198 A.D.) ibn Maymun (1135-1204 A.D.) and ibn Tufayl (d. 1185 A.D.) were great philosophers. Among the biographers, ibn al-Faradi (962-1013 A.D.) was a prominent scholar.