Competitive Exams Composition of meteorites Composition and types of meteorites and their origin are important topics for

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Composition And Classification Of Meteorites

Meteorites can be classified generally into three types:

- Stones - Stony meteorites resemble rocks found on and within the Earth. They are the most common type of meteorite, although because they resemble Earth rocks they are not commonly recognized as meteorites unless someone actually witnesses their fall. Stony meteorites are composed mainly of the minerals olivine, and pyroxene. Some have a composition that is roughly equivalent to the Earths mantle. Two types are recognized:
- Chondrites - Chondrites are the most common type of stony- meteorite. They are composed of small round glassy looking spheres, called chondrules, that likely formed from condensation from the gaseous solar nebula early in the history of the formation of the solar system. Most Chondrites have radiometric age dates of about. 4.6 billion years.
- Achondrites -Achondrites are composed of the same minerals as chondrites, but lack the chondrules. They appear to have been heated, melted and recrystallized so that the chondrules are no longer present. Most resemble volcanic rocks found on the Earths surface.
- Irons - Iron meteorit.es are composed of alloys of iron and nickel. They are easily recognized because they have a much higher density than normal crustal rocks. Thus, most meteorites found by the general populace of iron meteorites. When cut and polished, iron meteorites show a distinct texture called a Widmanstatten pattern. This pattern results from slow cooling of a once hot solid material. Most researchers suggest that such slow cooling occurred in the core of much larger body that has since been fragmented. Iron meteorites give us a clue to the composition of the Earths core.
- Stony Iron - Stony iron meteorites consist of a mixture of stony silicate material and iron. Some show the silicates embedded in a material of iron, nickel alloy. Others occur as a breccia, where fragments of stony and iron material have been cemented together by either heat or chemical reactions.

Origin of Meteorites

Most meteorites appear to be fragments of larger bodies called parent bodies. These t:ouJd have been small planets or large asteroids that were part of the original solar system. There are several possibilities as to where these parent bodies. or their fragments. originated. The Asteroid Belt: The asteroid belt is located between the orbits of Mars and Jupiter. It consists of a swarm of about 100,000 objects as asteroids. Asteroids are small rocky bodies with irregular shapes that have a cratered surface. About 4.000 of these asteroids have been officially classified and their orbital paths are known. Once they are so classified they are given a name. The asteroids are either remnants of a planet that. formed in the region between Mars and Jupiter but was later broken up by a collision with another planetary body, or are fragments that failed in accrete into a planet. The later possibility is more likely because the total mass of the asteroids is not even equal to our moon. It does appear that some of the asteroids are large enough to have undergone internal differentiation. Differentiation is a process that forms layering in II planetary body (i.e. the Earth has differentiated into a core, mantle, and crust). If these larger asteroids did in fact undergo differentiation, then this could explain the origin of the different types of meteorites. Because of the shapes of the asteroids it also appears that some of them have undergone fragmentation resulting from collisions with other asteroids. Such collisions could have caused the larger bodies to be broken up into the smaller objects we observe as meteorites.

The Asteroids as Parent Bodies of Meteorites: Much evidence suggests that the asteroids could be the parent bodies of met.eorit.es. The larger ones could have differentiated into a core, mantle and crust. Fragmentation of these large bodies would then have done two things:

First the fragments would explain the various types of meteorites found on Earth-the representing the mantle and crust of the original parent body, the irons representing the cores. and the stony irons the boundary between the core and mantle of the parent bodies.

Second, the collisions that caused the fragmentation could send the fragments into Earth crossing orbits. Some of the asteroids have orbits that bring them close to Earth. These are called Armor objects.

Some have orbital paths that cross the orbital path of the Earth. These are called Earth crossing asteroids or Apollo objects. All objects that have a close approach to the Earth are often referred to as Near Earth Objects or NEOs. About 150 NEOs with diameters between 1 and 8 km are known, but this is only a fraction of the total number. Many NEOs will eventually collide with the Earth. These objects have unstable orbits because they are under the gravitational influence of both the Earth and Mars. The source of these objects is likely the asteroid belt.