Unit - II

Solar System :- Bode's law of planetary distances - meteors, meteorites, comets, asteroids - kuiperbelt - Oortcloud - detection of gravitational waves - recent advances in astrophysics.

Solar System:-

⇒ planetary orbits.

⇒ Mass distribution

⇒ Angular momentum distribution

⇒ planets orbit roughly in the ecliptic plane

⇒ planetary orbits are slightly elliptical and very nearly circular.

⇒ planet and sun revolve and orbit in a west to east direction. The planets obliquity are small. Uranus and Venus are exception.

⇒ Meteorites differ in chemical and geologic Properties from the planets and the moon.

⇒ The rotation rates of the planets and asteroids are similar (5 to 15 hours)

⇒ planet distances from sun obey Bode's law

⇒ planet satellite system resemble the Solar system.

⇒ The oort cloud and Edgeworth Kuiper Belt of comets.

⇒ planets contain ~99% of the solar system AM but sun contains >99% of solar system's mass.

Bode's Law :-

Empirical prediction of planet distances from sun.

⇒ Begin with : 0, 3, 6, 12, 24, 48, 96, 192, 384

⇒ Now add 4 : 4, 7, 10, 16, 28, 52, 100, 196, 388

⇒ Then divide by 10 :

0.4, 0.7, 1.0, 1.6, 2.8, 5.2, 10.0, 19.6, 38.8.

⇒ Sequence is close to mean distance of planets from the sun.

⇒ Bode's Law or Titus-Bode's Law :-

$$r_n = 0.4 + 0.3 \times 2^n$$

planet	distance	Bode Law AU
Mercury	0.4	0.4
Venus	0.7	0.7
Earth	1.0	1.0
Mars	1.5	1.6
ceres	2.8	2.8
Jupiter	5.2	5.2
Saturn	9.6	10.0
Uranus	19.2	19.6
Neptune	30.07	38.8
pluto	39.5	77.2

=> Law lead Bode to predict existance of another planet between Mars and jupiter. Asteroids belt later found.

=> Uranus fitted law when discovered.

=> Neptune was discovered in 1846 at the position predicted by Adams, to explain the deviations of Uranus from its predicted orbit.

=> Pluto's orbit when discovered in 1930 did not fit the relation. Not a "planet".

Meteors :-

When meteoroids enter Earth's atmosphere at high speed and burn up the fire balls or "shooting stars". are called meteors.

Some times the number increases dramatically these events are termed meteor showers.

Meteorshowers occurs annually or at regular intervals as the regular intervals as the Earth passes through the trail of dusty debris left by a Comet. Meteor showers are usually named after a star or Constellation that is close to where the meteoss appear in the sky.

Meteoroids :-

These rocks still are in space. Meteroids range in size from dust grains to small asteroids.

Meteorites: when a meteoroid survives a trip through the atmosphere and hits the ground, it's called a meteorite.

Three types of meteorites:-

(i) Iron meteorites: which are almost completely made of metal.

(ii) Stony-iron meteorites: which have nearly equal amount of metal and silicate crystals.

(iii) Stony meteorites: which mostly have silicate minerals.

~~Meteoroids are small chunks of rock or iron in~~

⇒ A Meteoroid in the atmosphere becomes a meteorite after the ablation stops and the object continues on dark flight to the ground

⇒ A meteorite smaller than 1 millimeter can be called a micrometeorite. Micrometeorites do not have the typical structure a a fresh meteorite - ~~dust~~. Unaffected interior and fusion crust.

⇒ Foreign object on the surfaces of atmosphere bodies are not called meteorites (i.e there is no meteorite without a meteor) They can be called impact debris.

⇒ The size of meteoric smoke particles (MSP's) is typically in the sub 100 nm range.