ENTRY PHYSICS

angular momentum

[angular momentum] If $r(t)$ is the position of a mass point of mass m, then the vector $L = mrxr'$ is called the angular momentum.

C14 method

[C14 method] Used to estimate the age of substances containing carbon. It is useful in the range between 500 and 50'000 years. The C14 method is based on the asumption that the atmosphere has a constant C14 isotope conentration. The decay of C14 is compensated by creation of C14 in the stratosphere through cosmic radiation. A living plant has the same C14 concentration as the atmosphere. When it dies, the exchange of air stops and the C14 concentration in the plant will decay.

Gravity

[Gravity] a fundamental force which is responsible for the attraction of different masses like for example the Sun and the earth.

Keplers laws

[Keplers laws]
1. Law: (1609) Planets move on ellipses around the sun. The sun is in a focal point of the ellipse.
2. Law: (1609) The radius vector from the sun to the planet covers equal area in equal time.
3. Law: (1619) The squares of the periods of the planets are proportional to the cubes of the semiaxes of the planets.

Newton laws

[Newton laws] (Newton 1686) established four axioms
1. law) Bodies not subject to forces move along straight lines: $r'' = 0$.
2. law) Force is mass times acceleration $F = mr''$.
3. law) To every action there is a reation: $F_{12} = -F_{21}$.
4. law) Forces add like vectors: two forces F_1, F_2 acting on a body can be replaced by $F_1 + F_2$.

[Mass] measures amount of material in a body. The SI unit is 1 kilogram = 1kg. One liter of water at temperature $4°C$ has the mass of one kilogram. Typical masses are

- Electron $0.9 \cdot 10^{-30} kg$

- Hydrogen atom $210^{-27} kg$

- Virus $610^{-19} kg$

- Earth $6 \cdot 10^{24} kg$

- Sun $2 \cdot 10^{30} kg$

- Milkyway $10^{41} kg$

- Universe $10^{52} kg$

[Length] measures the position in space. The SI unit is 1 meter = 1m. The meter was originally defined as 1/40 millionth of the meridian of the earth but is sine 1960 defined spectroscopically. Typical lengths are

- Diameter of an atomic nucleus $3 \cdot 10^{-15} m$.

- Wave length of the visible light $5 \cdot 10^{-7} m$.

- Diameter of the earth $1.3 \cdot 10^{7} m$

- Diameter of the sun $1.4 \cdot 10^{9} m$

- Distance to alpha centauri $4 \cdot 10^{16} m$

- Diameter of the Milkyway $7 \cdot 10^{20} m$

- Diameter of universe $10^{26} m$.

[Maser] Maser stands for Microwave Amplification by Stiumlated Emision of Radiation. Masers are oscillators whose frequency are determined by quantized states of atoms or molecules. The frequencies of a Maser are in the microwave range.
[Power] is work per time or force times space. The SI unit is 1 Watt $1W = 1kgm^2/s^3$.

[Time] measures the position on the time axes. The SI unit is 1 second = 1s. The second was originally defined as a fraction of one tropical year. Since 1967 it is defined as 1s=9'192'631 177 periods of a Cesium 133 Maser oscillation. Typicl times:

- Light passing through kernel $10^{-24}s$.

- Light passes through atom $10^{-19}s$.

- Period of light $10^{-15}s$.

- Period of sound $10^{-3}s$.

- One day $10^5 s$.

- Life of a human $210^9 s$.

- Age of earth $1.3 \cdot 10^{17} s$

- Age of universe $5 \cdot 10^{17} s$

Relativitistic addition of velocities

[Relativitistic addition of velocities] As Poincare has realized first, the Maxwell equations are not invariant under Galilei transformations but under Lorentz transformations. The Michelson-Morely measurements of the speed of lights showed that light has a constant speed. The addition of velocities has therefore to be modified to a relativistic addition $v = (v_1 + v_2)/(1 + v_1 v_2/c^2)$. Using a mass which depends on the velocity $m = m_0/sqrt1 - v^2/c^2$ the Newton laws hold unmodified.

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