

PHYS 151

Lecture 01

Ch 01 Measurement

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Measuring Things

Physics is based on measurement

We measure each physical quantity in its own units

ex) 10 cm, 100 km/s, 200 kg

The International System of Units

In 1971, the 14th General Conference on Weights and Measures picked units forming the basis of the International System of Units (SI units)

Quantity	Unit name	symbol
Length	meter	m
Time	second	s
Mass	kilogram	kg

Length

The meter is the length of the path traveled by light in a vacuum during a time interval of $1/299\,792\,458$ of a second

Measurement	Length in Meters
Distance to the first galaxies formed	2×10^{26}
Distance to the Andromeda galaxy	2×10^{22}
Distance to the nearest star (Proxima Centauri)	4×10^{16}
Distance to Pluto	6×10^{12}
Radius of Earth	6×10^6
Height of Mt. Everest	9×10^3
Thickness of the page of your textbook	1×10^{-4}
Length of a typical virus	1×10^{-8}
Radius of a hydrogen atom	5×10^{-11}
Radius of a proton	1×10^{-15}

Time

One second is the time taken by 9 192 631 770 oscillations of the light (of a specified wavelength) emitted by a cesium-133 atom

Mass

The Standard Kilogram

1) SI standard of mass: platinum-iridium cylinder copied to other countries

2) The carbon-12 atom has 12 atomic mass units (u) and

$$1 \text{ u} = 1.6605402 \times 10^{-27} \text{ kg}$$

Summary

Physics is based on measurement

SI units

Length

Time

Mass

We will introduce more units as we go on