CHAPTER 1: INTRODUCTION TO PHYSICS

Extra Info

Definitions of the SI Base Units

Base Unit	Unit	Explanation
Length	**metre**	The metre is the length of the path travelled by light in a vacuum during a time internal of 1/ 299 792 458 of a second.
Mass	**kilogram**	The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram.
Time	**second**	The second is the duration of 9 192631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom.
Electric current	**ampere**	The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length of negligible circular cross-section and placed 1 metre apart in a vacuum, would produce between these conductors a force equal to 2×10^{-7} newtons per metre of length.
Thermodynamic temperature	**kelvin**	The kelvin, which is the unit of thermodynamic temperature, is the fraction 1/273. 16 of the thermodynamic temperature of the triple point of water.
Amount of substance	**mole**	1. The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is "mol". 2. When the mole is used, the elementary entities must be specified and these may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.
Luminous intensity	**candela**	The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of 1/ 683 watt per steradian.

SI base units

Order of Magnitude

In the study of physics, it is important to appreciate the order of magnitude of common physical quantities. The table below shows the order of magnitude of some chosen distances and time intervals.

Order of magnitude (*l*/m, T/s)	**Distance, *l*/m**	**Time interval, *T*/s**
10^{20}	Radius of our galaxy	Age of Earth (10^{17})
10^{12}	Radius of solar system	History of man
10^{8}	Distance of the Moon from the Earth	Human life span
10^{7}	Radius of Uranus	One year(3.15×10^{7})
10^{6}	Radius of Earth	One month
10^{4}	The east-to-west distance of Pulau Pinang	One day
1	Man's height	Time between heart beats
10^{-4}	Thickness of Al foil	Period of highest audible sound
10^{-7}	Wavelength of visible light	Period of long radio waves
10^{-10}	Diameter of a molecule	Period of oscillation of Cs atom
10^{-14}	Diameter of a nucleus	Period of visible light

Appreciation of order of magnitude

SI Prefixes

The 20 SI prefixes used to form decimal multiples and submultiples of SI units are given in the following table.

Factor	Name	Symbol	Factor	Name	Symbol
10^{24}	yotta	Y	10^{-1}	deci	d
10^{21}	zeta	Z	10^{-2}	centi	c
10^{18}	exa	E	10^{-3}	milli	m
10^{15}	peta	P	10^{-6}	micro	μ
10^{12}	tera	T	10^{-9}	nano	n
10^{9}	giga	G	10^{-12}	pico	p
10^{6}	mega	M	10^{-15}	femto	f
10^{3}	kilo	k	10^{-18}	atto	a
10^{2}	hector	h	10^{-21}	zepto	z
10^{1}	deka	da	10^{-24}	yocto	y

SI Prefixes

It is important to note that the kilogram is the only SI unit with a prefix as part of its name and symbol. Because multiple prefixes may not be used, in the case of the kilogram, the prefix names of the above table are used with the unit name "gram" and the prefix symbols are used with the unit symbol "g". With this exception, any SI prefix may be used with any SI unit, including the degree Celsius and its symbol ^{0}C.

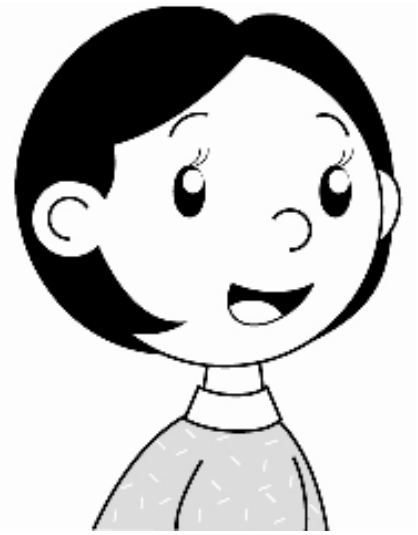
Example 1: 10^{-6} kg = 1 mg (one milligram),
but not 10^{-6} kg = 1μkg (one microkilogram)

Example 2: Consider the height, *h* of a building which is 169 000 mm.
We may write *h* =169 000 mm = 16 900 cm = 169 m = 0.169 km,
using the millimetre (SI prefix milli, symbol m), centimetre (SI prefix centi, symbol c), or kilometre (SI prefix kilo, symbol k).

Because the SI prefixes strictly represent powers of 10, they should not be used to represent powers of 2. Thus, one kilobit, or 1 kbit, is 1 000 bit and **not** 2^{10} bit = 1024 bit. To alleviate this ambiguity, prefixes for binary multiples have been adopted by the International Electrotechnical Commission(IEC) for use in information technology.

Answers for "Think"

1. Yes, you can compare the taste of fried rice with that of 'nasi lemak' and decide which is more delicious.
2. Different people may have different opinions.
3. Taste is not a physical quantity. Further more, we do not have special units of measurement and measuring tools to measure taste.
4. Sincerity, beauty and intelligence are not physical quantities.



My sister is more generous than my brother.
My sister gave me a brand new handphone for my birthday, but my brother only bought me a towel.
The handphone costs RM 800 but the towel only costs RM 2. I can compare generosity, so generosity is a physical quantity.

No, you are comparing the price of the gift. Yes, the price is a physical quantity, but generosity is not a physical quantity. A physical quantity must have a magnitude and usually a unit.