Physics Notes 2013

Physical Quantities, Units and Measurement Techniques

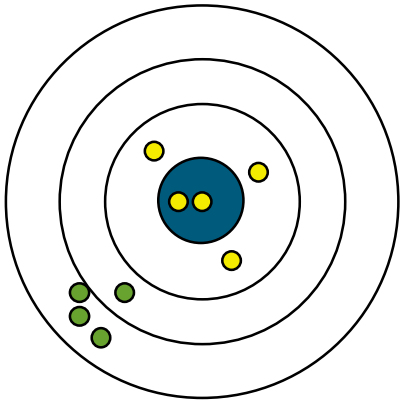
Accuracy and Precision:

Accuracy: The ability of a measurement to match the actual value of the quantity being measured.

Precision: The ability of a measurement to be consistently reproduced.

Dart-board Analogy:

A dart-board analogy is commonly used to illustrate the difference between accuracy and precision. Yellow darts are accurate, because they are close to the target [actual value]. Green darts are precise because they are close together, meaning the thrower is consistent.



Le Systeme International d'Unites:

Universal system of measurement units [revised version of the metric system]. There are 7 base SI units.

Base Quantity	Base Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

There are also derived units. They are basically made up of combinations of SI base units.

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Prefixes:

Prefixes are used with base units to increase or decrease value that they represent. All prefixes represent some factor of 10.

Prefix	Symbol	Multiply the base by
exa-	E	1 x 10^18
peta-	P	1 x 10^15
tera-	T	1 x 10^12
giga-	G	1 x 10^9
mega-	M	1 x 10^6
kilo-	k	1 x 10^3
hector-	h	1 x 10^2
deca-	da	1 x 10^1
deci-	d	1 x 10^-1
centi-	c	1 x 10^-2
milli-	m	1 x 10^-3
micro-	u	1 x 10^-6
nano-	n	1 x 10^-9
pico-	p	1 x 10^-12
femto	f	1 x 10^-15
atto-	a	1 x 10^-18

Significant Figures:

IF a number foes not have a decimal point and right most digit is 0, then it is unclear to the number of S.F it has.

For example,

20 = 20 [2 s.f] **At the same time,** 18 = 20 [rounded off to 1 s.f]

Using these rules, all these numbers have 3 s.f:

123
123,000

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12.3
End of thinking capacity. [e.t.c]

Rules for Calculating With S.F

General rule is to round the answer to the least precise measurement used in the calculation.

Number of decimal places given for a calculated quantity in addition and subtraction is the same as the least number of decimal places of measured quantities.

For example,

28.7 [3 s.f] + 2.75 [3 s.f] = 31.5 [3 s.f] [calculated value is 31.45]
0.04529 [5 s.f] + 0.0028 [4 s.f] = 0.0481 [4 s.f] [calculated value is 0.04809]
87.16 [4 s.f] - 0.7254 [4.sf] = 86.73 [4 s.f] [calculated value is 86.7346]

Same rules apply for multiplication and division.

Combined Calculations

In a single calculation involving all four calculation methods, perform calculations using BODMAS rule, then use the lowest [s.f] in the values obtained for final answer.

For example,

14.991 - 14.98/14.991 = 0.01/14.991 = 0.0007

Additional Notes

Ratio should be expressed as a decimal number to three significant figures.

Fractions, square roots and symbols should be avoided as answers. Answers for square roots should be presented as a value with 3 [s.f].

END

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