The Definitive Physics Definition List

Engineers of Dubious Quality

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1 Measurements

Express errors/uncertainties to 1 s.f. and write the measured value to the same decimal place as its error/uncertainty

Systematic Error	An error that occurs consistently more or consistently less than the actual reading.
Random Error	An error that occurs as a scattering (or spreading) of readings about the average or mean value of the measurements.
Precision	The ***reproducibility*** of a measurement. Repeated measurements which are very close to one another are precise measurements. Thus an experiment which has ***small random errors*** (i.e. small spread of readings) is said to have ***high precision***.
Accuracy	The ***agreement*** between the measured value and the true or accepted value of a quantity. An experiment which has ***small systematic errors*** is said to have ***high accuracy***. The ***average value*** is close to the true value.
Vector Quantity	A quantity that has a ***magnitude and direction***.
Scalar Quantity	A quantity that has a magnitude only.

2 Kinematics

We define a coordinate system with defined reference positive directions and we assume constant acceleration.

Displacement	$\mathbf{s}$	The distance travelled in a stated direction from a reference point.
Velocity	$\mathbf{v} = \dfrac{d\mathbf{s}}{dt}$	The rate of change of displacement with respect to time.
Speed	$v = \lvert\mathbf{v}\rvert = \left\lvert\dfrac{d\mathbf{s}}{dt}\right\rvert$	The rate of change of distance travelled with respect to time.
Acceleration	$\mathbf{a} = \dfrac{d\mathbf{v}}{dt} = \dfrac{d^2\mathbf{s}}{dt^2}$	The rate of change of velocity with respect to time.

3 Dynamics

3.1 Newton's Laws of Motion

1st Law	A body will continue in its ***state of rest***, or ***move*** at ***constant speed in a stright line*** unless an ***external resultant force*** acts on it.
→ Inertia	The resistance to change in the state of motion of an object
→ Mass	A property of that determines the objects inertia.
2nd Law	The ***rate of change of linear momentum*** of a body is ***directly proportional*** to the resultant force acting on it, and its direction is in the ***same direction*** as this resultant force. The ***force acting on an object*** is defined as the ***rate of change of linear momentum*** of an object. $$F \propto \frac{dp}{dt},\ F = ma \text{ (if constant mass)}$$
3rd Law	If body A exerts a force on body B, then body B will exert an ***equal and opposite*** force on body A. *Note:* Action-Reaction Pairs act on different bodies and are of the same nature.
Weight	The gravitational force acting on the object.
Weightlessness	There is no contact force acting on the object. *A body experiences apparent weightlessness when the resultant force acting on it is its weight, or it is undergoing freefall.*

3.2 Momentum

Linear Momentum	$\mathbf{p} = m\mathbf{v}$	The product of an object's mass and its velocity.
Impulse	$\mathbf{J} = \int_{t1}^{t2} \mathbf{F}dt = P_f - P_i$	The product of the average force acting on an object and the time interval that the force is being applied.
Principle of Conservation of Linear Momentum	The total momentum of the system is a constant when no external resultant force acts on it.	

4 Forces