Торіс	Definition	Examples	Formula / Notes	ð
Screw Gauge	Instrument to measure small thickness/diameter with high accuracy	Diameter of a wire, small ball bearings	Least Count = Pitch ÷ No. of divisio	ons
Slide Calipers (Vernier)	Measures internal/external dimensions & depth accurately	Diameter of test tube, depth of bottle	Least Count = 1 MSD – 1 VSD	
Pitch (Screw Gauge)	Distance screw moves in one full rotation	-	Pitch = Distance moved ÷ Number turns	· of
Least Count	Smallest measurement an instrument can read	Screw Gauge LC, Vernier LC	Screw Gauge: Pitch ÷ Divisions Vernier: 1 MSD – 1 VSD	
Constant Error	Error that occurs uniformly every time	Instrument always shows +0.1 cm	Fixed & predictable, e.g., due to calibration	
Positive Error	Measured value is <b>more</b> than true value	Reading = 5.2 cm instead of 5 cm	Corrected by subtracting excess	
Negative Error	Measured value is <b>less</b> than true value	Reading = 4.8 cm instead of 5 cm	Corrected by a cong missing amount	
Absolute Error	Difference between measured and true value	Maasured a 12 m D le 5 cm →	( \text{AE} =	
Relative Error	Ratio of absolute error to Quar value	$AE = 0.2 \text{ mine} = 5 \text{ m} \rightarrow 0.04$	AE True value	
Percentage Pror	Measured value is <b>less</b> than true value Difference between measured and true value Ratio of absolute eror to Quar value Relative error expressed in <b>O O O</b> Relative error expressed in <b>O O O</b>	RE = 0.04 → 4%	$\mathrm{RE}\times100\%$	
Physical Quantity	Any property that can be measured	Mass, Length, Time	Must be expressed with units	
Fundamental Quantity	Cannot be derived from other quantities	Length, Time, Mass, Temperature	7 total (in SI)	
Derived Quantity	Formed by combining fundamental quantities	Area = Length × Breadth, Speed = Dist./Time	Has formula, e.g., Speed = Distance ÷ Time	
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# 2.1 Definitions

**Motion:** A body is said to be in motion if its position changes with time relative to a fixed point.

**Rest:** A body is said to be at rest if it does not change its position with time relative to a fixed point.

# 2.2 Types of Motion

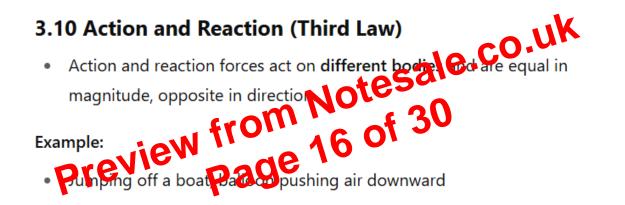
pe of Motion	Description	Example
Translatory Motion	Whole body moves in the same direction	Car moving on road
Rotatory Motion	Body spins around a fixed axis	rotation
Oscillatory Motion	Body spins around a fixed axis To-and-fontolion about a meth position Repeats in regular time intervals	Pendulum, swing
Priodic Motion	Repeats in regular time intervals	Hands of a clock
Random Motion	Motion without fixed path or direction	Dust particles in air
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#### Friction – A Necessary Evil:

• It is helpful yet causes loss of energy.

## **3.9 Gravitational Force**

- Force of attraction between any two masses
- On Earth: F=mg, where  $g=9.8\,m/s^2$



### 3.11 Units Summary

Quantity	Unit	Symbol
Force	Newton	Ν
Mass	kilogram	kg
Acceleration	m/s <sup>2</sup>	m/s <sup>2</sup>
Momentum	kg·m/s	kg·m/s

### 4.1 Work

Work: Work is said to be done when a force is applied on an object and it causes displacement.

- Formula:  $W = F imes d imes \cos heta$ 
  - F: force, d: displacement,  $\theta$ : angle between force and displacement
- Unit: Joule (J)
- 1 Joule = Work done when 1 N of force displaces an object by 1 m

Positive Work: When force and displacement are in same direction. Negative Work: When force and displacement are in opposite directions. Zero Work: No Energy: Capacity of Work. Different Form displacement occurs.



- Mechanical (Kinetic + Potential)
- Heat Energy •
- Chemical Energy •
- Light Energy •
- Sound Energy
- Electrical Energy
- Nuclear Energy •

#### 4.6 Efficiency

Efficiency: Ratio of useful energy output to total energy input

• Formula:  $\mathrm{Efficiency} = rac{\mathrm{Useful\ Output}}{\mathrm{Total\ Input}} imes 100\%$ 

### 4.7 Sources of Energy

Source	Examples	Renewable?
Fossil Fuels	Coal, Petrol, Diesel	No
Solar Energy	Sunlight	Yes
Wind Energy	Wind turbines	Yes
Hydro Energy	Dams, waterfalls	Yes CO.UK Co.UK
Biomass	Cow dung, organic waste	<b>G</b> es
Nuclear Energy	Nuclear Ason of Uranium	No (but long-lasting)
Preview	Cow dung, organic waste Nucleas fits on of Uranium 1900	

#### 4.8 Conservation and Transformation of Energy

- Law of Conservation of Energy: Energy can neither be created nor destroyed. It only transforms from one form to another.
- Examples:
  - Electric fan: Electrical  $\rightarrow$  Mechanical
  - Solar panel: Light → Electrical

#### 4.9 Mass-Energy Relation

Einstein's equation:

- $E = mc^2$ 
  - E: energy (J), m: mass (kg), c: speed of light  $pprox 3 imes 10^8$  m/s