

KINEMATICS – REVIEW

QUANTITY	SYMBOL OF QUANTITY	UNIT(S)	SYMBOL OF UNIT	DEFINITION	EQUATION
distance	s	metre(kilometre, centimetre, ...)	m (km, cm, ...)	length that a moving object travelled	see bellow according to type of motion
displacement	\vec{s} - vector			distance and direction of a moving object	
time	t	second (minute, hour, ...)	s (min, h, ...)	scalar quantity – it has only magnitude	we derive from other equations
speed	v	metre per second (kilometre per hour)	ms ⁻¹ (kmh ⁻¹)	distance travelled in taken time	$v = \frac{s - s_0}{t - t_0} = \frac{\Delta s}{\Delta t}$
velocity	\vec{v}			displacement in taken time	$\vec{v} = \frac{\Delta \vec{s}}{\Delta t}$
acceleration	\vec{a}	metre per second squared	ms ⁻²	change in velocity in taken time	$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$
deceleration	$-\vec{a}$				

Note: lower index 0 means quantity in the beginning of measurement, for example initial speed or u

TYPES OF MOTION

I Linear (along straight line) motion

1 Steady – an object moves at constant speed: $s = s_0 + vt$

(2.02 Motion graphs, p.20/ A,B; 21/E)

2 Accelerated – an object moves at increasing speed, at steady acceleration: $v = u + at$

(2.02 Motion graphs, p.21/ F)

$$s = s_0 + ut + \frac{1}{2}at^2 \quad (2.02 \text{ Motion graphs, p.20/C})$$

example: a) free fall of a dropped body from height h with steady acceleration $a = g = 10\text{ms}^{-2}$ $v = gt$

$$s = h = \frac{1}{2}gt^2$$

b) a body thrown at initial speed u downwards from height h :

$$v = u + gt$$

$$h = ut + \frac{1}{2}gt^2$$

c) a body thrown at initial speed u upwards:

$$v = -u + gt$$

$$s = -ut + \frac{1}{2}gt^2$$

$$\text{at maximal height } h: 0 = -u + gt_m \rightarrow t_m = \frac{u}{g}$$

$$h = \frac{1}{2}gt_m^2$$

II Motion in two dimensions: Projectile motion – an object thrown horizontally at speed u from height h :

a) vertically - free fall: $h = \frac{1}{2}gt^2$ t is time taken by the object reaches the ground

b) horizontally: steady motion at speed u : $s = ut$ horizontal distance travelled by the object

