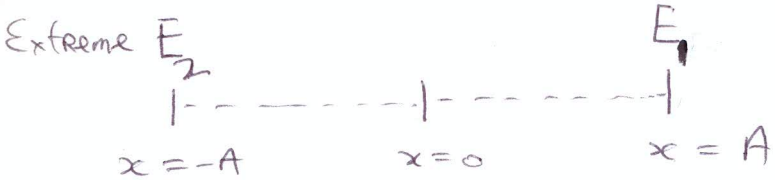
THE KINEMATICS OF SHM



x is displacement from mean position.

3, 4 KEY NUMBERS IN USING FORMULAE

$$a = -\omega^2 x$$

$$x = A\sin\omega t \quad [\text{or } A\cos\omega t]$$

$$v^2 = \omega^2(A^2 - x^2)$$

$$T = \frac{2\pi}{\omega}$$

where

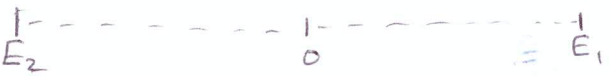
ω, constant, indicates the frequency of oscillations

A, constant, defines the amplitude (max. displacement) of the particle

v, speed of particle at any point.

T, periodic time; time to execute a complete oscillation

NOTES



REGION	DISPLACEMENT, x	ACCELERATION	VELOCITY	SPEEDING/SLOWING
$O \rightarrow E_1$	+	−	+	DECELERATING
$O \leftarrow E_1$	+	−	−	Accelerating
$E_2 \leftarrow O$	−	+	−	DECELERATING
$E_2 \rightarrow O$	−	+	+	Accelerating
	I	II	III	IV

① Taking column I and II together explains why acceleration described by $a = -\omega^2 x$ is always directed towards centre. [Explains need for minus]

② Negative acceleration doesn't mean the particle is slowing down [as it did in ALM]
To decide if particle is slowing/speeding up need to examine the SIGNS of accel and vel together. [See columns II, III, IV] LIKE SIGNS ⇒ speeding up, UNLIKE signs ⇒ Slowing