Simple Harmonic Motion

Simple Harmonic Motion (SHM) is motion in which the acceleration of a particle is always towards a fixed point on the line of motion of . The **acceleration is proportional to the displacement**  of from .





Simple Harmonic Motion:

General solution

Writing in harmonic form:

So, the general solution of SHM can be expressed as a sine function from which we can deduce:

1. The solution varies between a and –a **Amplitude**
2. The solution is periodic with **Period**
3. The velocity and acceleration can be found by differentiating the solution with respect to t.

Example

A particle is moving along a straight line. At time seconds its displacement, m from a fixed point is such that .

Given that at and the particle is moving with velocity 4 ms-1,

(a) find an expression for the displacement of the particle after seconds

(b) hence determine the maximum displacement of the particle from .

Example

A particle , is attached to the ends of two identical elastic springs. The free ends of the springs are attached to two points and . The point lies between and such that is a straight line and . The particle is held at and then released from rest.

At time seconds, the displacement of the particle from is m and its velocity is ms-1. The subsequent motion of the particle can be described by the differential equation .

1. Describe the motion of the particle.

Given that and when ,

(b) solve the differential equation to find as a function of

(c) state the period of the motion and calculate the maximum speed of .

Ex 8B