ii) 1. Suggest two reasons why the amplitude of the oscillation decreases with time.

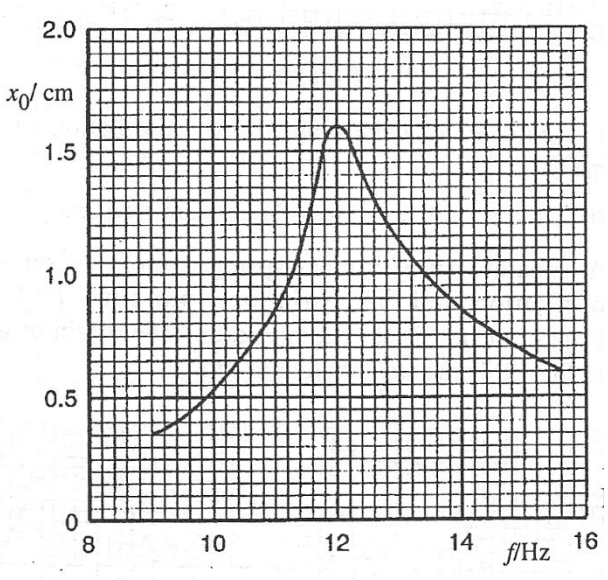
2. Calculate the decrease in energy of the oscillation during the first 1.0 s.

D12 N09/III/1c

In normal use, a loudspeaker produces a range of frequencies of sound. Suggest why it is important that the natural frequency of vibration of the cone of the loudspeaker is not within this range of frequencies.

D13 N05/II/4 (modified)

The figure shows the variation with frequency f of amplitude x of the forced oscillations of a machine.



(a) State

(i) what is meant by a forced oscillation. [1]

(ii) the name of the effect illustrated in the figure. [1]

(b) At any value of frequency, the oscillations of the machine are simple harmonic.

(i) Calculate for the machine vibrating at maximum amplitude, the maximum magnitudes of

1. the linear speed [3]
2. the linear acceleration [2]

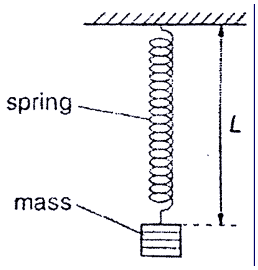
(ii) Determine the time interval between maximum linear speed and subsequent maximum linear acceleration [2]

(c) The mass of the machine is increased. Suggest what effect this increase mass will have on the shape of the the figure. You may draw in the figure if you wish. [3]

D14 N2010/III/6

a) Define force.

b) A light helical spring is suspended vertically from a fixed point, as shown in the figure on the right.



Different masses are suspended from the spring. The weight W of the mass and the length L of the spring are noted. The variation with weight W of the length L is shown in the figure below.

(i) On the figure, show clearly the area of the graph that represents the energy stored in the spring when the weight on the spring is increased from zero to 5.0 N.

(ii) For a spring undergoing an elastic change, the force per unit extension of the spring is known as the force constant k. Show that the energy E stored in the spring for an extension x of the spring is given by the expression

$$E = \frac{1}{2}kx^2$$