

A level Physics B

H557/03 Practical skills in physics

Question Set 2

- 1 (a) (i) This question is about the behaviour of a mass on a spring.

The table below shows how the extension x of a spring varies as the mass m suspended vertically from it alters.

m/g	x/cm
100	2.5
200	5.1
300	7.5
400	9.9
500	12.5
600	15.0

Fig. 1.1

Apply a test to the data to see if the extension of the spring is proportional to the applied force. Explain your method and state your conclusion.

[3]

- (ii) Calculate the spring constant k of this spring.

$$g = 9.8 \text{ N kg}^{-1}$$

$$k = \dots\dots\dots \text{ Nm}^{-1}$$

[1]

- (b) In order to investigate the behaviour of an oscillating mass and spring system, the spring is suspended vertically below a vibration generator. A mass is added to the bottom of the spring. The arrangement is suspended above an ultrasound distance sensor as shown in Fig. 1.2.

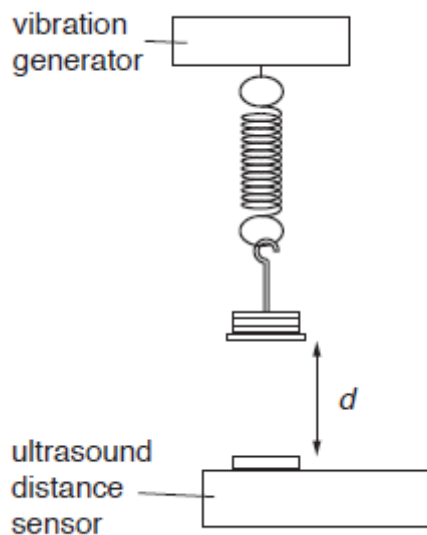


Fig. 1.2

With the vibration generator switched off, the mass is given a small vertical displacement then released. A few oscillations later the ultrasound distance sensor is started and the trace shown in **Fig. 1.3** is displayed on a computer.

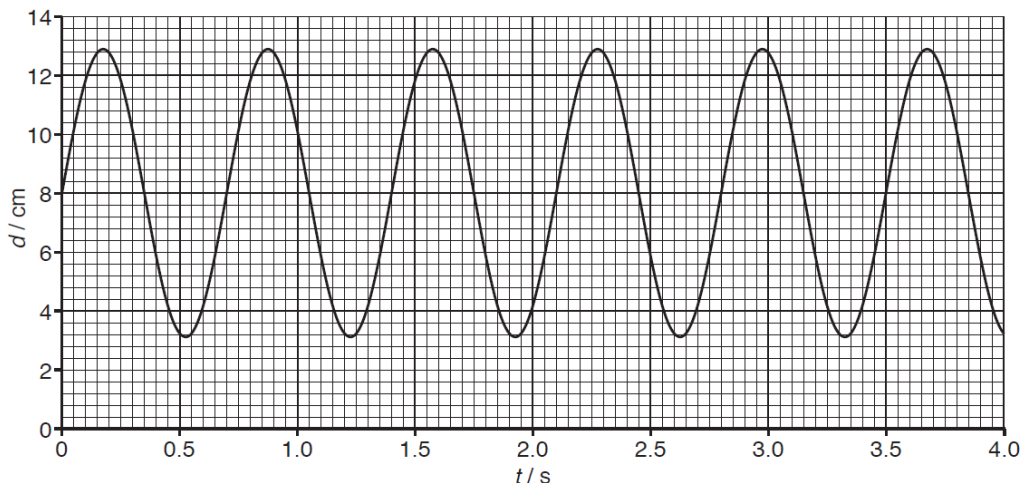


Fig. 1.3

- (i) Mark **two** points on the curve shown in **Fig. 1.3**, to indicate where the speed of the oscillating mass is at its maximum. Label each point with a letter **V**.

[1]

- (ii) Use data from the trace shown in **Fig. 1.3** to calculate the natural frequency f of the mass and spring system.

$$f = \dots\dots\dots \text{ Hz}$$

[2]

- (iii) Show that the mass m supported by the spring is about 500g.

[2]

- (c)* By connecting the vibration generator to a signal generator it is possible to use this apparatus to investigate forced oscillations of the mass and spring system. Describe in as much detail as possible how you would carry out the investigation, the data that you would record and what you would expect the results to show.

[6]

Total Marks for Question Set 2: 15

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