

Name of the Student: _____

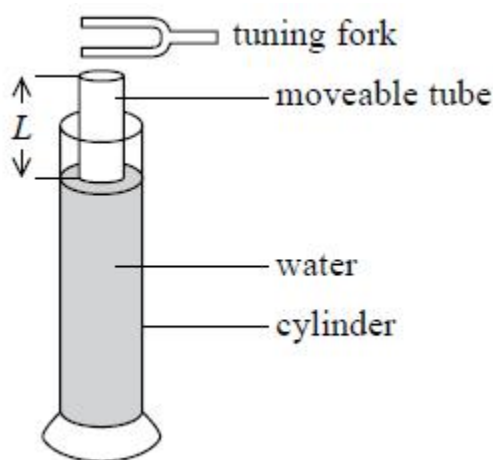
Max. Marks : 26 Marks

Time : 26 Minutes

Q1.

A set of tuning forks is used to find a value for the speed of sound in air.

A tuning fork is struck and then held near to the end of an air column formed by a moveable tube. The moveable tube is used to adjust the length, L , of the air column until a standing wave is set up in the tube and the loudest sound is heard. The experiment is repeated for a number of different tuning forks.



The following results are obtained by a student.

Fork frequency/Hz	Length, L /cm	Speed of sound/ m s^{-1}
256	31.9	327
320	25.6	328
512	16.1	330

Student A says "These results show that the speed of sound increases as the frequency of the sound increases".

Student B says "The speed of sound should be the same for each frequency".

By estimating the uncertainties in these results, conclude which of these statements is valid.

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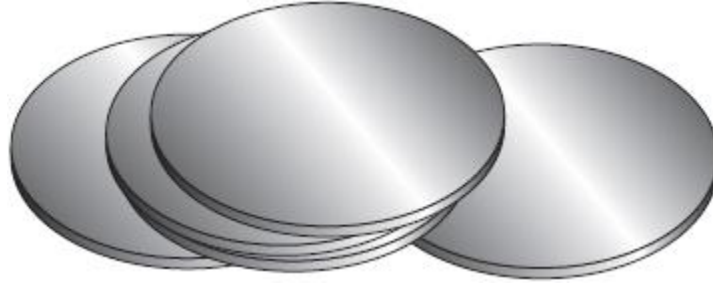
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(Total for question = 4 marks)

Q2.

A student is investigating the properties of steel. He has fifty steel discs available.



Each disc has a diameter $d \approx 1.3$ cm and a thickness $t \approx 2$ mm.

A balance which can measure mass with a resolution of 0.2 g is available.

Determine the minimum number of discs that should be placed on the balance together if the percentage uncertainty in the measurement of the mass is to be less than 0.5%.

(4)

density of steel = 7900 kg m^{-3}

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Minimum number of discs =

(Total for question = 4 marks)

Q3.

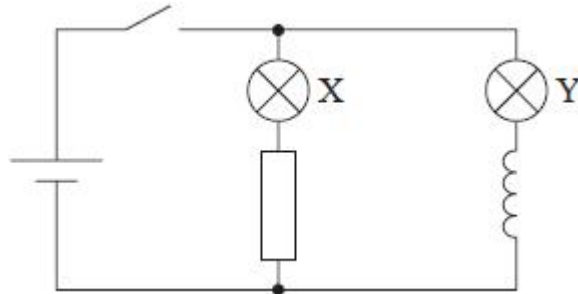
Radioactive decay is often described in textbooks as a spontaneous, random process.

* Explain why there is an exponential decrease in the rate of decay for a sample containing a large number of unstable nuclei.

(Total for question = 1 mark)

Q5.

A circuit is set up as shown in the diagram. Lamps X and Y are identical. The coil has a soft iron core. The resistor and the coil have the same resistance.



The switch is closed and lamp X lights instantly.

Which statement best describes lamp Y after the switch is closed?

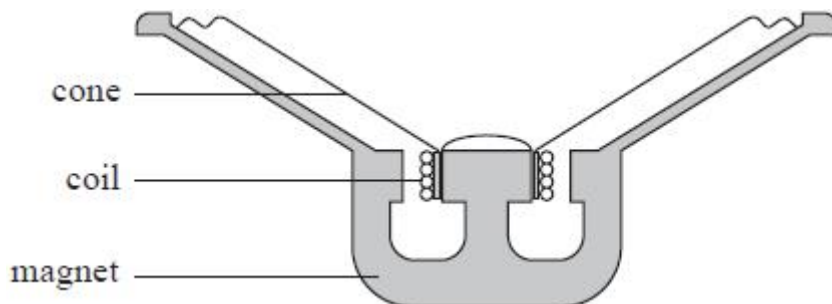
(1)

- A Lights after a delay with a final brightness less than X
- B Lights after a delay with a final brightness the same as X
- C Lights instantly with less brightness than X
- D Lights instantly with the same brightness as X

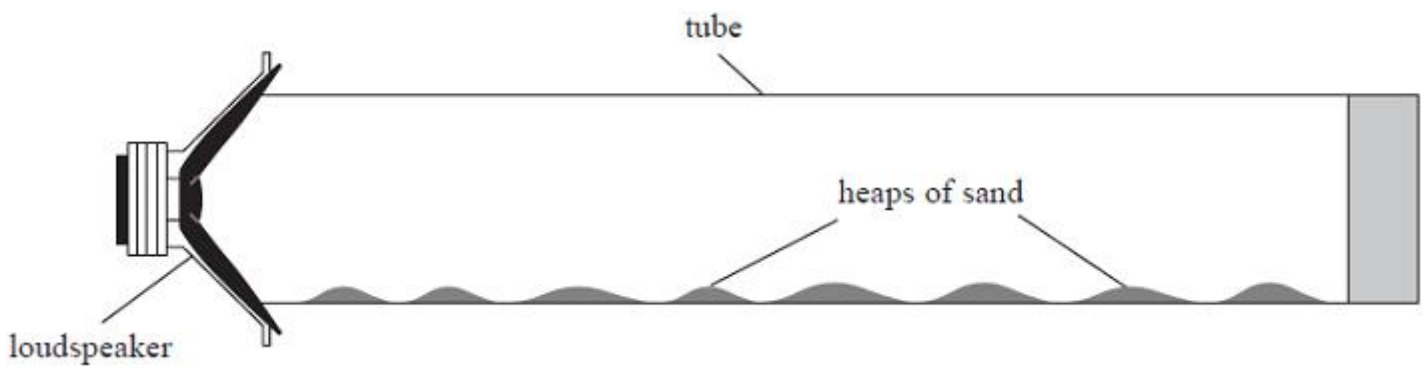
(Total for question = 1 mark)

Q6.

A simple loudspeaker consists of a cone, a coil of wire and a magnet. The cone and coil are attached to each other and are free to move. An alternating current in the coil causes the cone to oscillate. The loudspeaker is mounted in a wooden box. A cross-section through the loudspeaker is shown.



The student connected a signal generator to the loudspeaker, and placed the loudspeaker near to one end of a long tube containing sand. The student adjusted the signal generator until the sand collected in small heaps as shown.



(i) Explain why the sand collects in heaps.

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(ii) The student determined the distance d between the centres of adjacent heaps.
Describe the procedure she should follow to determine an accurate value for d .

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(iii) Assess whether the experimental data is consistent with a value for the speed of sound of 340 m s^{-1} .
signal generator frequency = 3.25 kHz .
 $d = 5.1 \text{ cm}$

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(Total for question = 10 marks)