Exam Questions:

1. Describe an experiment to demonstrate that sound is a wave motion. [2005] [2003]

2. A sound wave is diffracted as it passes through a doorway but a light wave is not.
   Explain why. [2006]

3. Define Natural Frequency.

4. Define Resonance.

5. How does resonance occur in an acoustic guitar? [2006]

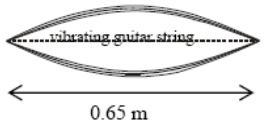
6. The frequency of a stretched string depends on its length.
   Give two other factors that affect the frequency of a stretched string. [2005]

7. What is the relationship between the frequency of a vibrating stretched string and its length? [2008]

8. What is the relationship between frequency and tension for a stretched string? [2006]

9. A stretched string of length 80 cm has a fundamental frequency of vibration of 400 Hz. [2006]
   What is the speed of the sound wave in the stretched string?

10. [2005]
The diagram shows a guitar string stretched between supports 0.65 m apart.



The string is vibrating at its first harmonic. The speed of sound in the string is 500 ms^{-1}.
   (i) What is the frequency of vibration of the string?
   (ii) Draw a diagram of the string when it vibrates at its second harmonic.
   (iii) What is the frequency of the second harmonic?

11. What does (i) the pitch, (ii) the loudness, (iii) the quality of a musical note depend on? [2008]

12. What are the frequency limits of audibility?

13. Define Sound Intensity [2007] [2002]

14. Define Threshold of Hearing.

15. The sound intensity doubles as a person approaches a loudspeaker. What is the increase in the sound intensity level? [2004]

16. A loudspeaker has a power rating of 25 mW. What is the sound intensity at a distance of 3 m from the loudspeaker? [2007]

17. The loudspeaker in Question 16 is replaced by a speaker with a power rating of 50 mW. [2007]
   (i) What is the change in the sound intensity?
   (ii) What is the change in the sound intensity level?

18. Sound Intensity level can be measured in dB or dB(A). What is the difference between the two scales? [2003]

19. Why do we have a decibel adapted (dBA) scale?

20. The human ear is more sensitive to certain frequencies of sound.
   How is this taken into account when measuring sound intensity levels? [2007]

21. [2006]
The following data was recorded in an experiment to measure the speed of sound using a resonance tube.

f/Hz	512	480	426
l/cm	16.0	17.2	19.4
Diameter of column of air = 2.05 cm			

(i) How was the length of the column of air was adjusted?
(ii) How was the frequency of the column of air was measured?
(iv) How was the diameter of the column of air was measured?
(v) How was it known that the air column was vibrating at its first harmonic?
(vi) Using all of the data, calculate the speed of sound in air.

22. Sketch the graph you would draw in the experiment To Investigate the relationship between Natural Frequency and Length.

23. Sketch the graph you would draw in the experiment To Investigate the relationship between Natural Frequency and Tension.

24. A student investigated the variation of the fundamental frequency *f* of a stretched string with its length *l*. [2004]
(i) Draw a labelled diagram of the apparatus used in this experiment.
(ii) Indicate on the diagram the points between which the length of the wire was measured.
(iii) The student drew a graph, using the data recorded in the experiment, to illustrate the relationship between the fundamental frequency of the string and its length.
State the relationship and explain how the graph verifies it.

25. A student investigated the variation of the fundamental frequency *f* with tension *T*. [2004]
The length was kept constant throughout this investigation.
(i) How was the tension measured?
(ii) What relationship did the student discover?
(iii) Why was it necessary to keep the length constant?
(iv) How did the student know that the string was vibrating at its fundamental frequency?

26. A student obtained the following data during an investigation of the variation of the fundamental frequency f of a stretched string with its tension T. [2002]
The length of the string was kept constant.

T/N	15	20	25	30	35	40	45
f /Hz	264	304	342	371	402	431	456

(i) Describe, with the aid of a diagram, how the student obtained the data.
(ii) Why was the length of the string kept constant during the investigation?
(iii) Plot a suitable graph on graph paper to show the relationship between fundamental frequency and tension for the stretched string.
(iv) From your graph, estimate the tension in the string when its fundamental frequency is 380 Hz.

27. A string on a guitar is vibrating at its fundamental frequency of 500 Hz. Its length is 0.6 m and its mass per unit length is 0.02 kg m^{-1}. Calculate the tension in the string.