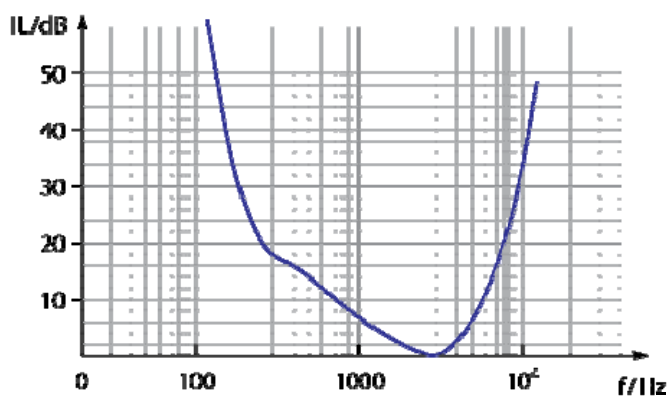


Support Worksheet – Option I, Worksheet 1

- 1 State the part of the ear where **frequency discrimination** takes place. [1]
- 2 Describe what happens to the eardrum when sound is incident on it. [1]
- 3 State the role of the **ossicles** in the process of hearing. [2]
- 4 The area of the eardrum and that of the oval window are different. State the effect this has on the ability of the ear to detect a sound. [2]
- 5 State the range of frequencies that are audible to a healthy young person. [1]
- 6 Describe how the range you stated in the previous question changes as the person gets older. [2]
- 7 The response of the ear to loudness is said to be logarithmic. State what this means. [1]
- 8 Define **sound intensity level**. [1]
- 9 The intensity of sound incident on the eardrum is $2.6 \times 10^{-9} \text{ W m}^{-2}$. Calculate the sound intensity level at the eardrum. [2]
- 10 The sound intensity level at the eardrum is 92 dB. Calculate the intensity of the sound incident on the eardrum. [2]
- 11 The diagram shows the threshold of hearing curve for a person.



- a State the frequency at which the ear is most sensitive. [1]
 - b The ear canal has length L . It is suggested that the frequency at which the ear is most sensitive corresponds to the fundamental standing wave for sound in the ear canal. Estimate the length L . (Take the speed of sound in air to be 340 m s^{-1} .) [3]
 - c Calculate the range of frequencies for which sound of intensity $2.8 \times 10^{-10} \text{ W m}^{-2}$ can be heard. [2]
- 12 Define the term **half-value thickness**. [1]
 - 13 Define the term **attenuation coefficient**. [1]



- 14 The half-value thickness for X-rays of energy 200 keV for aluminium is 2.17 cm . Calculate the fraction of the intensity of X-rays that are transmitted through 2.30 cm of aluminium. [3]
- 15 State how an X-ray image may be made sharper. [2]
- 16 Describe a method by which better contrast may be achieved in an X-ray image of the intestines. [2]
- 17 Outline the principles behind **computed tomography**. [4]
- 18 Explain why computed tomography requires the use of powerful computers. [2]
- 19 State what is meant by **ultrasound**. [1]
- 20 Outline how ultrasound is produced. [2]
- 21 Define **acoustic impedance** of a medium. [1]