

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Q1.

- (a) Sound waves are incident on a human ear.

Describe how the frequency and amplitude of the vibrations change as the wave is transmitted through the ear to the fluid in the inner ear.

(2)

- (b) Explain how the components of the ear act to amplify the pressure changes due to the sound wave.

(3)

- (c) A sound intensity meter, set to the dB scale, is placed near to a source of sound. The intensity level reading on the sound meter is 82 dB.

Calculate in, W m^{-2} , the intensity of the sound at the meter.

intensity = _____ W m^{-2}

(3)

- (d) The sound intensity meter is 2.0 m from the source which is emitting sound equally in all directions.

Calculate the power emitted by the source.

power = _____ W

(2)

(Total 10 marks)

Q2.

Positron Emission Tomography (PET) and ultrasound scans are both used in medical diagnosis. Compare the quality of the information obtained from these scans in terms of:

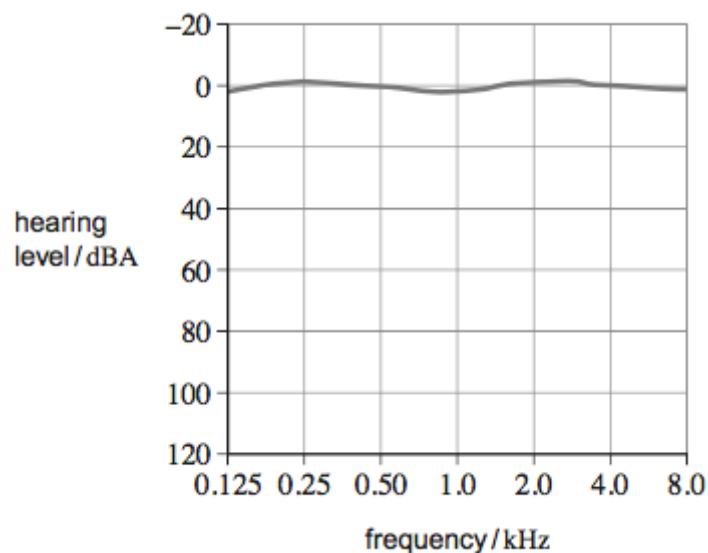
- patient safety and convenience
- information available to the doctor from the images.

Q3.

Three people were given routine hearing tests. One person was found to have normal hearing and the other two were found to have defective hearing.

- (a) **Figure 1** shows the variation of hearing level with frequency for the person found to have normal hearing.

Figure 1



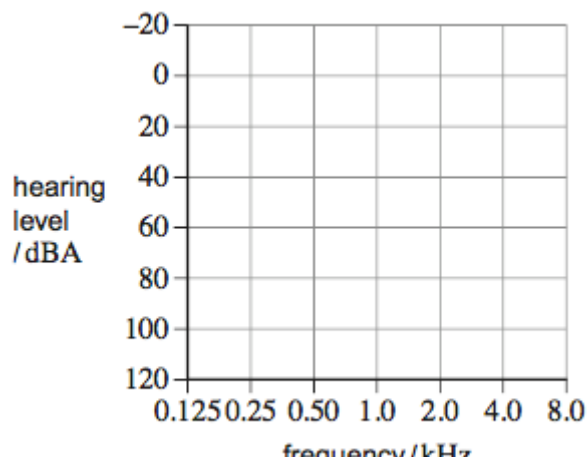
It is known that the ear of a person with normal hearing is much more sensitive at 3 kHz than at other frequencies.

Explain why the graph indicates little variation with frequency.

(2)

- (b) Of the other two people, one was found to be suffering from age-related hearing loss and the other was found to be suffering from noise-related hearing loss.
- (i) Sketch on **Figure 2** the curve you would expect to see for the person suffering from age-related hearing loss.

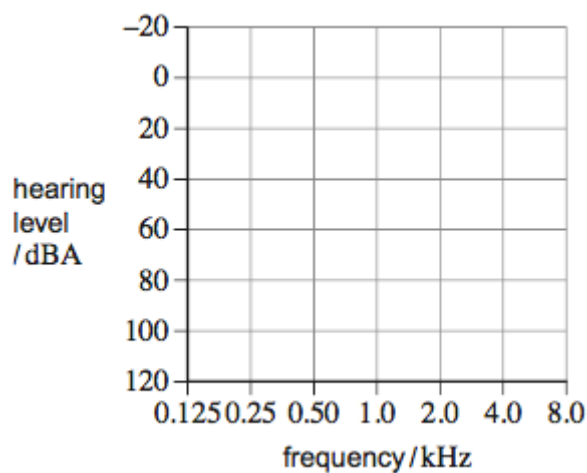
Figure 2



(1)

- (ii) Sketch on **Figure 3** the curve you would expect to see for the person suffering from noise-related hearing loss.

Figure 3



(2)

- (c) A foghorn at the top of a cliff produces a sound. A sound meter on the deck of a ship 400 m away from the cliff gives a reading of 92 dB.

- (i) Calculate the intensity of the sound incident on the sound meter.

$$I_0 = 1.0 \times 10^{-12} \text{ W m}^{-2}$$

$$\text{intensity} = \underline{\hspace{2cm}} \text{ W m}^{-2}$$

(2)

- (ii) The sound from the foghorn is emitted equally in all directions. Assume that the sound is not reflected at the surface of the sea and that there is no attenuation of the sound.

Estimate the power emitted by the foghorn

power = _____ W
(2)
(Total 9 marks)