Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

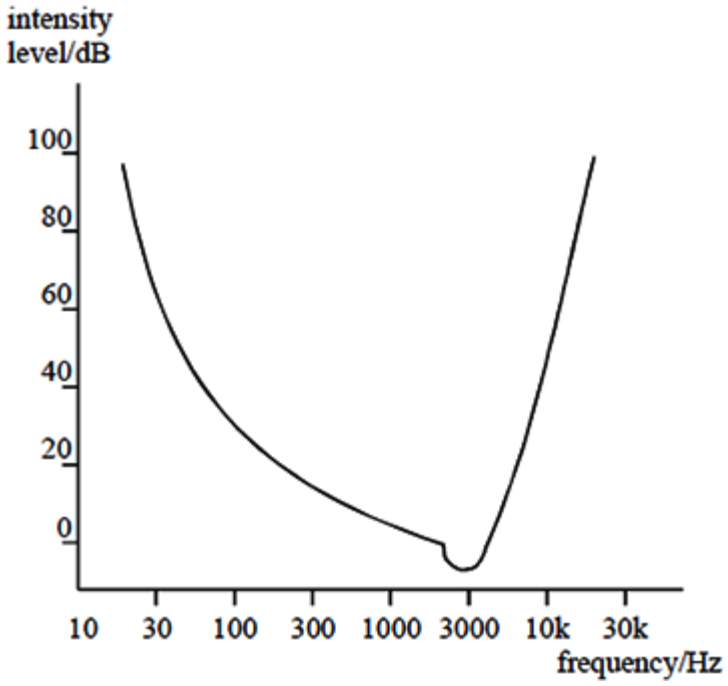
Q1.

(a) threshold of hearing – lowest intensity of sound detected by human ear **(1)**
reference intensity (1.0×10^{-12} W m^{-2}) is taken at 1 kHz **(1)**

(2)

(b) basic shape **(1)**
range (30Hz – 20kHz approx) **(1)**
minimum between 1 kHz and 3 kHz **(1)**

scale, including units **(1)**
logarithmic **(1)**



(5)

(c) (i) $I_2 = 10^6 I_1$ **(1)** $= 10^6 \times 1.0 \times 10^{-12} = 1.0 \times 10^{-6}$ W m^{-2} **(1)**

(ii) number of dB $= 10\log_{10}\left(\frac{I_2}{I_1}\right) = 10\log_{10}\left(\frac{112}{100}\right)$ **(1)** $= 0.5$(dB) **(1)**

(4)

[11]

Q2.

(a) surface of body covered with an oil to improve transmission

from ultrasound transducer to body **(1)**

short ultrasound pulses sent into the body and echoes received

from surfaces detected by the transducer **(1)**

oscilloscope sweep time synchronised with the ultrasound pulse frequency **(1)**

(3)

(b) (i) thickness = $\frac{1}{2}\ v\ \Delta t$ **(1)** = $\frac{1}{2}$ × 1500 × 0.08 × 10^{-3} (m) **(1)**

= 0.06 m **(1)**

(ii) pulse duration = 0.3 × 0.02 = 0.006 m s **(1)**

(max 3)

(c) extra distance in tissue results in more signal absorption *

smaller fraction of signal reflected at second surface *

pulse more spread over time *

signal is diffracted *

* any two **(1) (1)**

(2)

[8]