**Q1.**     (a)     State the frequency of sound at which the normal ear is most sensitive.

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**(1)**

(b)     State the main features of hearing loss in terms of frequency response for

(i)     age-related hearing loss,

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(ii)     noise-related hearing loss.

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**(2)**

(c)     At the site of a machine in a factory, a sound meter was used to measure the sound level. The relative intensity level with the machine operating was 86 dB. The sound intensity reaching the meter when the machine was not operating was $7.0 \times 10^{-5}$ $Wm^{-2}$.

(i)     Show that with the machine operating, the sound intensity reaching the meter was about $4 \times 10^{-4}$ $Wm^{-2}$.

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(ii)     Calculate the relative intensity level due to the machine alone.

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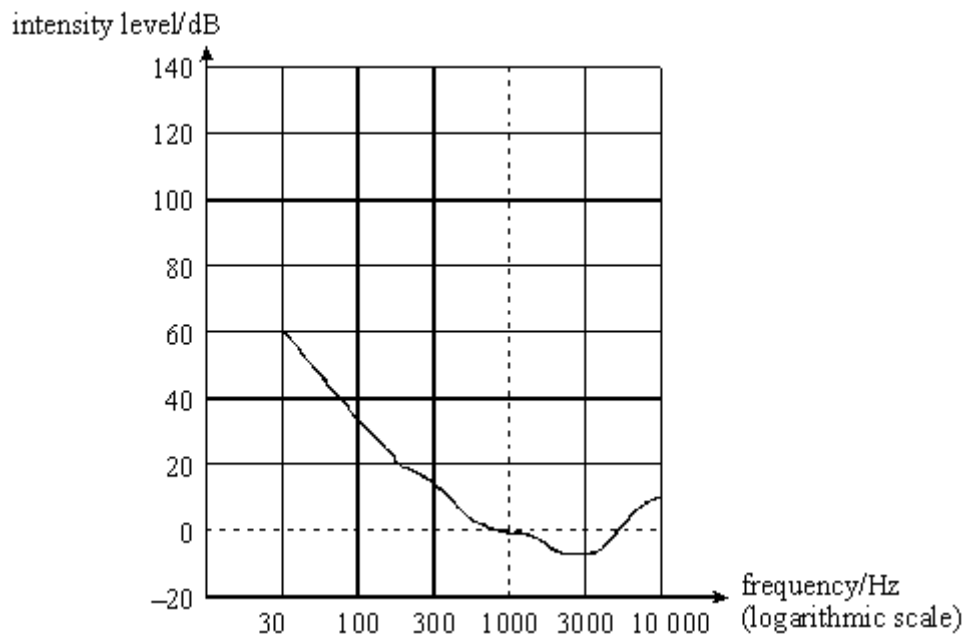.............................................................................................................

**(4)**
**(Total 7 marks)**

**Q2.** (a) The graph shows the equal loudness curve for the threshold of hearing.

intensity level/dB



(i) On the diagram sketch the equal loudness curve which has an intensity level of 120 dB at a frequency of 1000 Hz. (120 phon)

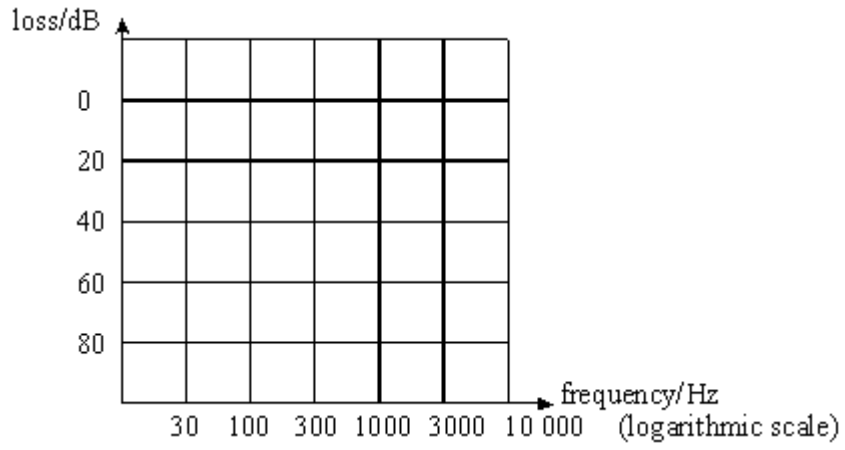(ii) What is the main similarity between the two curves?

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**(2)**

(b) On the axes below draw the curves for:

(i) age-related hearing loss and label it A,

(ii) noise-induced hearing loss and label it B.

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loss/dB

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       ^
   0 ──┼──────────────────────────────
  20 ──┼──────────────────────────────
  40 ──┼
  60 ──┼
  80 ──┼
       │                              frequency/Hz
       └──┬───┬───┬────┬────┬────┬──────►
         30  100 300 1000 3000 10 000   (logarithmic scale)
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(iii)    What is the main difference between the two types of hearing loss?

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**(4)**
**(Total 6 marks)**