

A1

Addition: 0 dB
Campagne: $30 < L < 40$ dB
Circulation: $60 < L < 90$ dB
Train: $80 < L < 100$ dB
Dolofif: 120 dB

A2

$$L = 10 \cdot \log\left(\frac{I}{I_0}\right) \Leftrightarrow \frac{I}{I_0} = 10^{L/10}$$

$$L = 3 \text{ dB} \Rightarrow \frac{I}{I_0} \approx 2$$

ΔL [dB]	$\frac{I}{I_0}$
3	2
6	4
9	8
10	10

A3

Effet de masque:

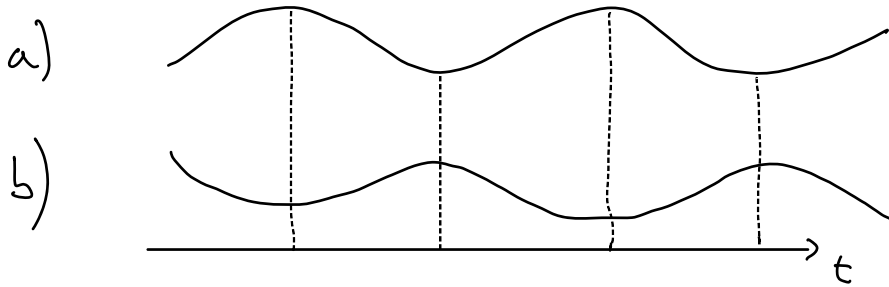
voiture + camion = 70 dB
60 dB 70 dB

A4

- ⊕ large dynamique de d'intensité (10^{-12} à 1 W/m^2)
- ⊖ plus compliqué à calculer (log, etc..)

A5

- I ondes cohérentes (relation de phase stable)
- II même fréquence
- III opposition de phase



exemple: casque audio suppression de bruit.

B1

$$L = 10 \cdot \log\left(\frac{I}{I_0}\right), \quad I_0 = 10^{-12} \frac{W}{m^2}$$

B4

$$L = 20 \cdot \log\left(\frac{P}{P_0}\right), \quad P_0 = 20 \cdot 10^{-6} Pa$$

B1

$I \left[\frac{W}{m^2} \right]$	10^{-6}	$2 \cdot 10^{-6}$	$4 \cdot 10^{-6}$	10^{-5}
$L [dB]$	60	63	66	70

B2

$$L = 10 \cdot \log\left(\frac{I}{I_0}\right)$$

$$\Leftrightarrow \frac{L}{10} = \log\left(\frac{I}{I_0}\right)$$

$$\Leftrightarrow 10^{\frac{L}{10}} = \frac{I}{I_0}$$

$$\Leftrightarrow I_0 \cdot 10^{\frac{L}{10}} = I \quad \Leftrightarrow \underline{I = 10^{-5} \frac{W}{m^2}}$$

B3

Solution 1 :

$$L = 10 \cdot \log\left(\frac{I}{I_0}\right)$$

$$* \log(x \cdot y) = \log(x) + \log(y)$$

DOUBLEMENT
($\Leftrightarrow$)

$$L = 10 \cdot \log\left(2 \cdot \frac{I}{I_0}\right)$$

($\Leftrightarrow$)

$$L = \underbrace{10 \cdot \log\left(\frac{I}{I_0}\right)}_{=L} + 10 \cdot \log(2) = \underline{L + 3 \text{ dB}}$$

Solution 2 :

DOUBLEMENT :

$$I_2 = 2 \cdot I_1$$

$$L' = 10 \cdot \log\left(\frac{I_2}{I_1}\right) = 10 \cdot \log\left(2 \cdot \frac{I_1}{I_1}\right)$$

$$\Leftrightarrow L' = 10 \cdot \log(2) \approx \underline{3 \text{ dB}} = 0,3 \text{ Bell}$$

TRIPLE:

$$L'' = 10 \cdot \log \left(3 \cdot \frac{I_1}{I_1} \right) = 10 \cdot \log(3) \approx \underline{4.8 \text{ dB}}$$

B4

$$L = 20 \cdot \log \left(\frac{P}{P_0} \right) \quad \text{avec} \quad P_0 = 20 \cdot 10^{-6} \text{ Pa}$$

$$L_{\min} = 40 \text{ dB}$$

$$L_{\max} = 80 \text{ dB}$$

$$\text{Dynamique de la voix: } 80 - 40 = \underline{40 \text{ dB}}$$

B5

$L[\text{dB}]$

a)

$$\begin{array}{rcl} (1) & 82 & \\ (2) & 80 & \end{array} \begin{array}{l} \nearrow \\ \searrow \end{array} + 2 \text{ dB (voir annexe 6.4} \rightarrow +2 \text{ dB)}$$

$$\begin{array}{rcl} (1)+(2) & 84 & \\ (3) & 77 & \end{array} \begin{array}{l} \nearrow \\ \searrow \end{array} + 7 \text{ dB } (\rightarrow +1 \text{ dB})$$

$$(1)+(2)+(3) \quad \underline{85 \text{ dB}} = L_{1,2,3}$$

b)

$$\begin{array}{rcl} L_{1,2,3} & = & 85 \text{ dB} \\ L_4 & = & 72 \text{ dB} \end{array} \begin{array}{l} \nearrow \\ \searrow \end{array} + 13 \text{ dB } (\rightarrow \geq 10 \Rightarrow 0 \text{ dB})$$

$$L_{1-6} = 85 \text{ dB}$$

EFFET DE MASQUE

EXTRA

$$L = 10 \cdot \log\left(\frac{I}{I_0}\right), \quad I = \frac{P^2}{S \cdot C}$$

$$\Rightarrow L = 10 \cdot \log\left(\frac{P^2 / \cancel{S \cdot C}}{P_0^2 / \cancel{S \cdot C}}\right) = 10 \cdot \log\left(\frac{P}{P_0}\right)^2$$

$$\stackrel{*}{\Rightarrow} L = 20 \cdot \log\left(\frac{P}{P_0}\right)$$

$$* \log(x)^y = y \cdot \log(x)$$