1. A microphone produces at its output a voltage level of –31 dBu, when at the microphone diaphragm is a sound pressure level of 94 dBSPL. **a)** How many dB of gain level is necessary from the preamplifier if you want to reach the international analogue line level of +4 dBu? **b)** What is the amplification factor?

a) Gain level has to be $L = 31 + 4 = $ **35 dB. b)** The amplification factor is (gain) $v = 10^{(35/20)} = $ **56.2**

2. The sound can not be used in a vacuum. As a medium for sound transmission we use usually air.
a) What is the most abundant element in air? **b)** Which percentage of this element is present in the air?
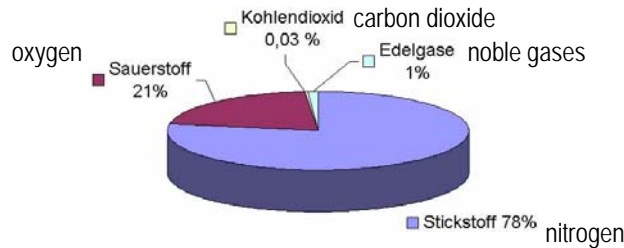
a) nitrogen

b) 78 percent.

3. How much is the output signal of a microphone when the following preamplifier with a gain (amplification) of $v = 26$ dB provides a signal of 200 mV at the amplifier output?

$10^{(26dB/20)} = V_{out} / V_{in}$. The output signal of the microphone is the input signal of the amplifier.
$V_{in} = V_{out} / (10^{\wedge}(26\ dB / 20))$. 26 dB are an amplification of $v = 19.95$-fold, or about 20 times. The microphone delivers at its output an audio voltage of 200 mV / 19.95 = **10.02 mV.**

4. A sound engineer emailed me that he had made a "raff" mix of its 22 tracks, including a "base drum". How should the two words in quotation marks "raff" and "base drum" written correctly?

Rough-mix and bass drum.

5. For the analog sound recording, we need a recording head, a reproducing head and an erasing head. Why is there no erasing head using the digital recording?

In digital recording no separate erasing head is needed because the recording goes into magnetic saturation and that deletes at the same time automatically the old recording.

6. **a)** How is the sound pressure defined? **b)** What is the reference value for the sound pressure?

a) The sound pressure is defined like the usual pressure $p = F / A$, that is force divided by area. The sound pressure variations are superimposed to the stationary air pressure. The force is measured in newtons:
1 N = 1 (kg·m/s²)
b) The reference sound pressure is the mean threshold of hearing at $p_0 = 20$ μPa according to
$0.00002 \cdot 10^5$ Pa.

7. The data of a microphone are showing the maximum SPL given as 138 dB and the equivalent noise level is specified at 16 dB.
a) What is the dynamic range of the microphone in decibels?
138 minus 16 = **122 dB.**
b) What is the noise ratio in decibels? (This is based on a sound pressure level of 94 dB).
 94 minus 16 = **78 dB.**

The equivalent noise level can have different weighting factors (A-rated or CCIR 468). The dynamic range is then also assigned to this factor. The noise ratio "S / N re 94 dB SPL" is 94 dB minus the equivalent noise level. The max. SPL should usually be given for 0.5% THD. However, when the indication is given for 1% THD, then subtract 6 dB to get a more correct comparison.