<table>
<thead>
<tr>
<th>L2SQ1</th>
<th>Speech is intelligible if frequencies up to 3.5 kHz are preserved. What is the Nyquist rate?</th>
<th>7 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2SQ2</td>
<td>Music is often filtered to include sounds up to 20 kHz. What sampling rate should we use?</td>
<td>$f_s &gt; 40 \text{kHz}$</td>
</tr>
<tr>
<td>L2SQ3</td>
<td>Assume we sample at the vertical lines. Digitize the waveform using four-bit samples. The dots above represent the closest horizontal lines (as best I can tell). The bit sequence would be: 0111 1010 1001 0101 0111 1100 1100 0110 0110 1010 1111 (“clipping”!) 1111 1000 0111 1000</td>
<td></td>
</tr>
<tr>
<td>L2SQ4</td>
<td>If the voltages 2.93 and 5.26 are quantized to the nearest 0.25 V, what are the quantization errors?</td>
<td></td>
</tr>
<tr>
<td>L2SQ5</td>
<td>How many levels in a 10-bit quantizer?</td>
<td>1024</td>
</tr>
<tr>
<td>L2SQ6</td>
<td>When sampling at $f_s = 8 \text{ Hz}$, what is the frequency of the signal above after reconstruction?</td>
<td>1 Hz</td>
</tr>
<tr>
<td>L2SQ7</td>
<td>Under what conditions on sampling and on quantization will you incur a loss of information?</td>
<td>Quantization will always incur an error - Sampling must be done at the Nyquist rate or higher to avoid introducing additional error.</td>
</tr>
<tr>
<td>L2SQ8</td>
<td>CD-quality music is sampled at 44.1 kHz with a 16-bit quantizer. How much memory (in Bytes) is used to store 10 seconds of sampled-and-quantized data?</td>
<td>882000 bytes</td>
</tr>
<tr>
<td>L2SQ9</td>
<td>CD-quality music is sampled at 44.1 kHz with a 16-bit quantizer. It is stored on a 700 MB CD. How many minutes of music do you predict a single CD can hold? (Does your answer account for stereo?)</td>
<td>132 min mono</td>
</tr>
<tr>
<td>L2SQ10</td>
<td>Digital voice mail samples at 8 kHz. 32 MB of memory is filled after 3200 seconds of recording. How many bits of resolution is the quantizer utilizing?</td>
<td>10 bits/sample</td>
</tr>
</tbody>
</table>