Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Suppose that a population of nasty mutant flesh-eating bacteria is doubling every 5 hours, and that initially there were 300 bacteria. Give a formula for the size of the population after \( t \) hours.

\[
P(t) = 300 \cdot 2^{t/5}
\]

<table>
<thead>
<tr>
<th>( t )</th>
<th>( P(t) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>5</td>
<td>600</td>
</tr>
<tr>
<td>10</td>
<td>1200</td>
</tr>
</tbody>
</table>

2. Suppose that the amount of radioactive strontium in a town's water supply is given by \( S(t) = 5000 \cdot 2^{-t/29} \), where \( t \) is in years and \( S(t) \) is in grams. How long will it take until less than 1000 grams remain?

\[
S(t) = 5000 \cdot \left(\frac{1}{2}\right)^{t/29}
\]

\[
\frac{\ln 1 - \ln 5}{\ln 1 - \ln 2} \leq \frac{t}{29}
\]

\[
-\frac{\ln 5}{\ln 2} \leq \frac{t}{29}
\]

\[
29 \left(\frac{\ln 5}{\ln 2}\right) \leq t
\]

\[
t > 67.3359 \text{ yrs}
\]

Check: \( S(67.3359) = 5000 \cdot \left(\frac{1}{2}\right)^{67.3359/29} = 1000 \)

\( S(67.3360) = 5000 \cdot \left(\frac{1}{2}\right)^{67.3360/29} \approx 999.9979 \)