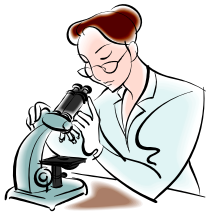
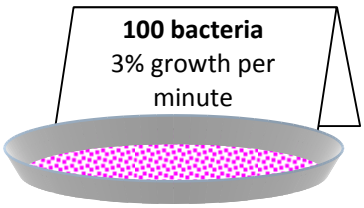
A biologist is studying types of bacteria that all multiply at different rates.



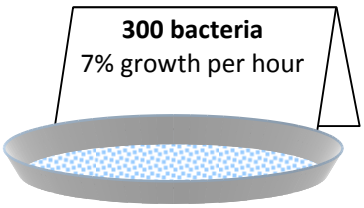
She knows how many bacteria are in each sample to start with and how quickly they will multiply. Help her predict how many bacteria will be in each petri dish after the time stated, rounding each answer to the nearest whole number.

1



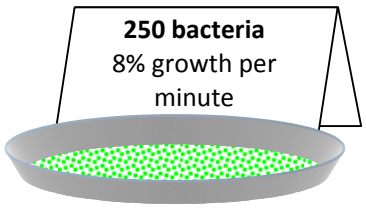
How many after two minutes?

2



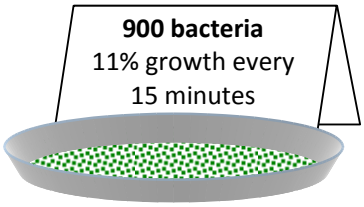
How many after six hours?

3



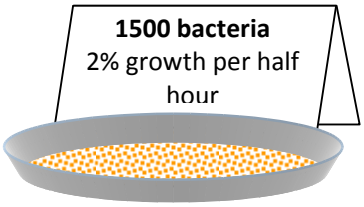
How many after five minutes?

4



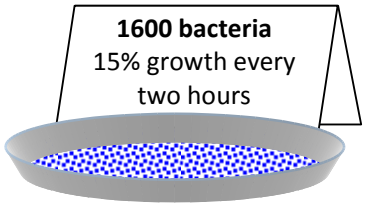
How many after one hour?

5



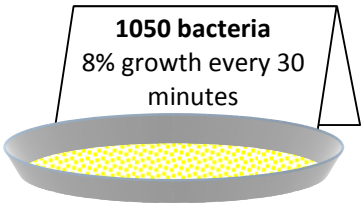
How many after four hours?

6



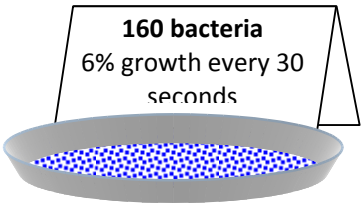
How many after eight hours?

7



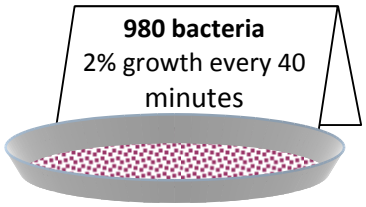
How many after 2.5 hours?

8



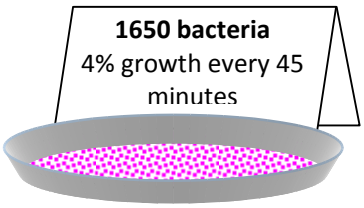
How many after one minute?

9



How many after two hours?

10



How many after six hours?

Extension

If any one of these samples could make us ill, discuss the implications of a sample 'escaping' and contaminating its surroundings. Which bacteria do you think would be the most dangerous?

Answers

1. $100 \times 1.03^2 = 106$
2. $300 \times 1.07^6 = 450$
3. $250 \times 1.08^5 = 367$
4. $900 \times 1.11^4 = 1366$
5. $1500 \times 1.02^8 = 1757$
6. $1600 \times 1.15^4 = 2798$
7. $1050 \times 1.08^5 = 1543$
8. $160 \times 1.06^2 = 180$
9. $980 \times 1.02^3 = 1040$
10. $1650 \times 1.04^8 = 2258$

The 'most dangerous' bacteria would be the one that grows the quickest (of course, it really depends on exactly what the bacteria is!). The bacteria that may prove to be the most dangerous is the sample in dish 8 as it has the quickest growth rate of 6% every 30 seconds.

Interesting extension

This resource could be used to explore logarithms if you pose the question:

How long will it take each sample to double in size?

E.g. For sample one:

$$\begin{aligned} 100 \times 1.03^x &= 200 \\ 1.03^x &= \frac{200}{100} = 2 \\ x &= \log_{1.03} 2 \\ &= 23.4497... \end{aligned}$$

The sample will take 23 minutes to double in size.