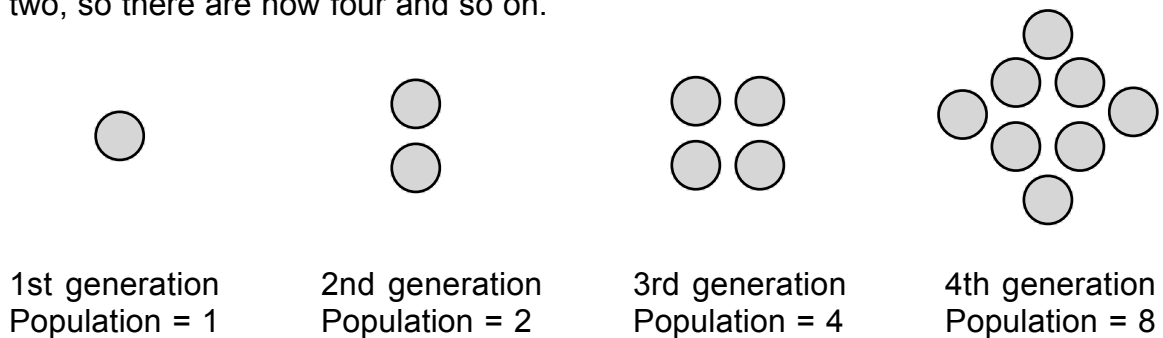


## Data sheet

## Bacterial growth

Bacteria are tiny single-cell organisms, too small to be seen without a microscope. Millions of bacteria live in the human body and help to keep us alive. Some bacteria are harmful to us - such as those that grow on decaying food: they can make us ill with food poisoning if they get inside us.

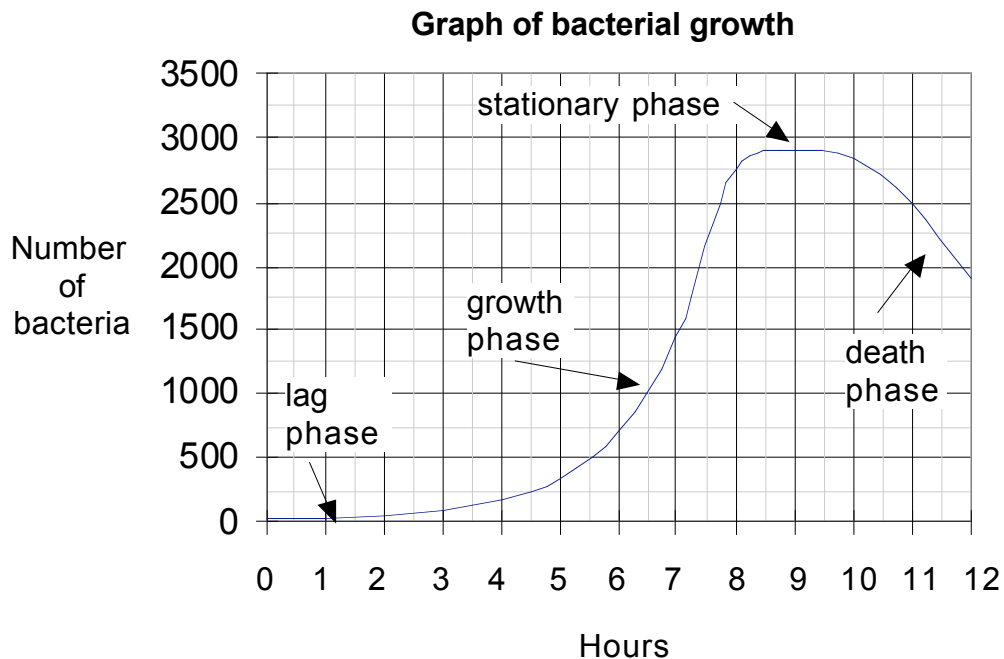
Bacteria grow in numbers by splitting into two parts (some types split into more than two parts). For example, a one-cell bacterium increases in size and then splits, forming two single-cell bacteria. These then grow and each one splits into two, so there are now four and so on.



Some bacteria populations grow rapidly and can reach millions in a few hours. Other are much slower and may take days for each cell-division.

### Phases of growth

Bacteria can be grown in a laboratory by giving them warmth and nutrients. The population growth of bacteria usually follows a pattern. Here is an example:



There is an initial 'lag phase' as the bacteria get used to their environment. Then comes the growth phase and the population increases rapidly. This eventually slows down as the available food is used up and the population stops increasing (the stationary phase). Finally there is no food left, waste products build up and the bacteria start to reduce in numbers as they begin to die. This is the death phase.

## Questions

## Bacterial growth

1

From the graph of bacterial growth on the data sheet, estimate answers to the following:

(a) What is the number of bacteria in the population after 7 hours?

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(b) What is the maximum number the population reaches?

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(c) How long is the population at maximum size?

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2

Find two points on the graph during the growth phase that show that over an hour the population approximately doubles.

At ----- hours, the population is -----

At ----- hours, the population is -----

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3

A type of bacterium cell (not the one in the graph) divides into two, every 20 minutes.

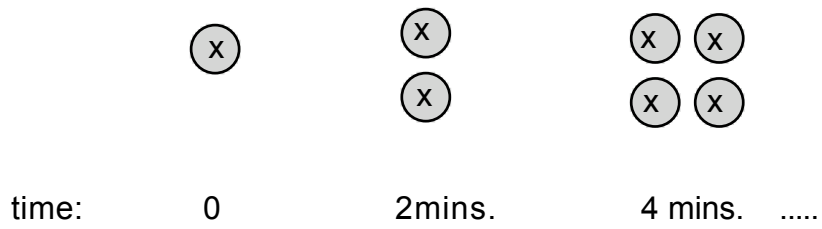
Starting with 5 bacteria, what will be the population after 3 hours?  
Give your answer to the nearest hundred.

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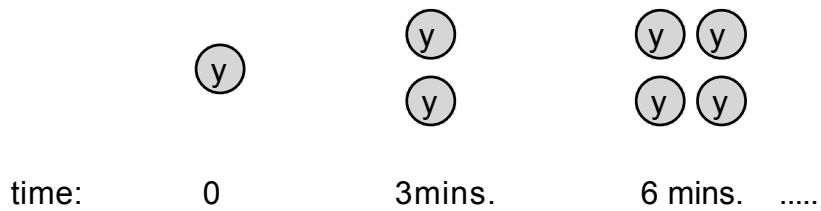
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4

An organism, X, splits into two at each division.  
This occurs every 2 minutes.



Another organism, Y, splits into two at each division.  
This occurs every 3 minutes.



After 30 minutes, how many times bigger is the population of X  
than the population of Y?

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