In Class Exercises (ICE) - 11/6/00

The pictures shown below are photographs taken through a microscope. They show the growth of Streptococcus pneumoniae bacterial cells. The times are given in minutes. Each distinct little 'blob' represents a single bacterial cell. Some of the slides are a little difficult to interpret, because of the way that bacteria reproduce. For example, a quick look at the picture taken at 37 minutes appears to show five bacterial cells. In fact, there are only four.

Most bacteria reproduce via a process called binary fission. In this process, a bacterial cell produces a copy of all of the cellular machinery (such as DNA and energy-producers like mitochondria) that a bacterial cell needs to survive. When everything has been copied, the bacteria just splits in two, so that there are two bacterial cells where previously there was only one. In the picture taken at 37 minutes, one of the bacterial cells is just about to split into two.

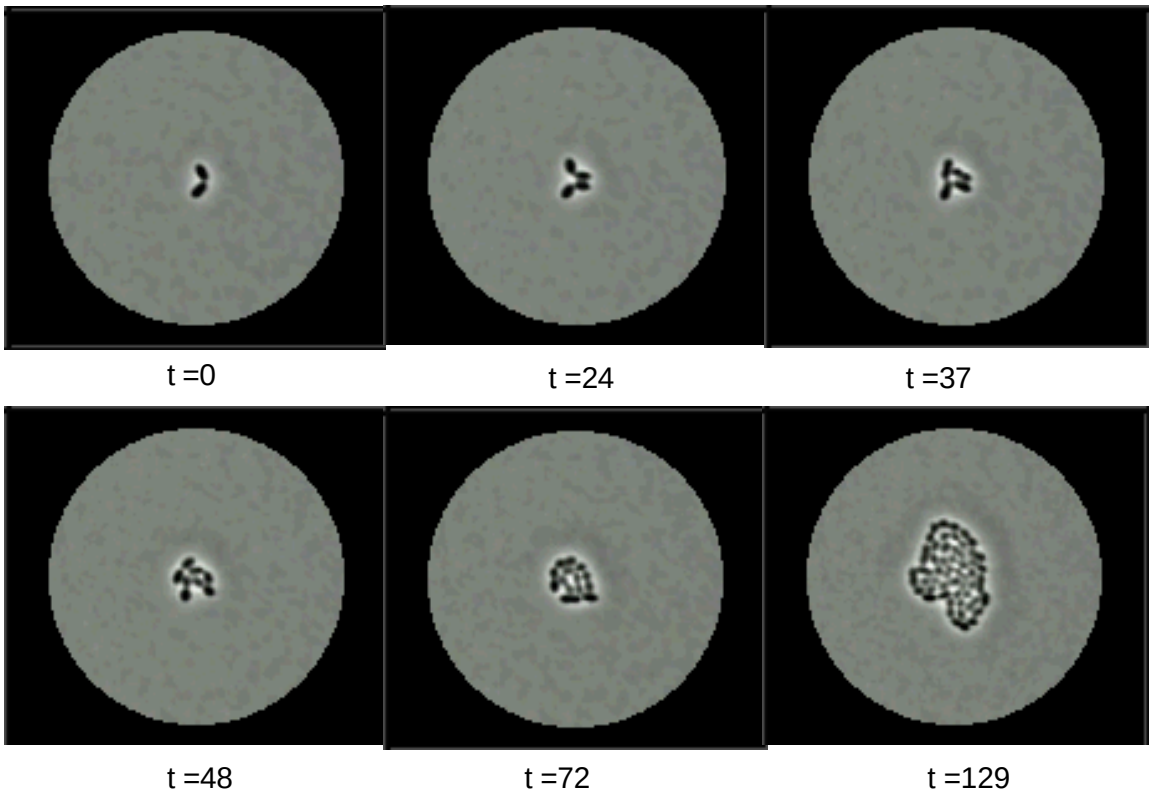
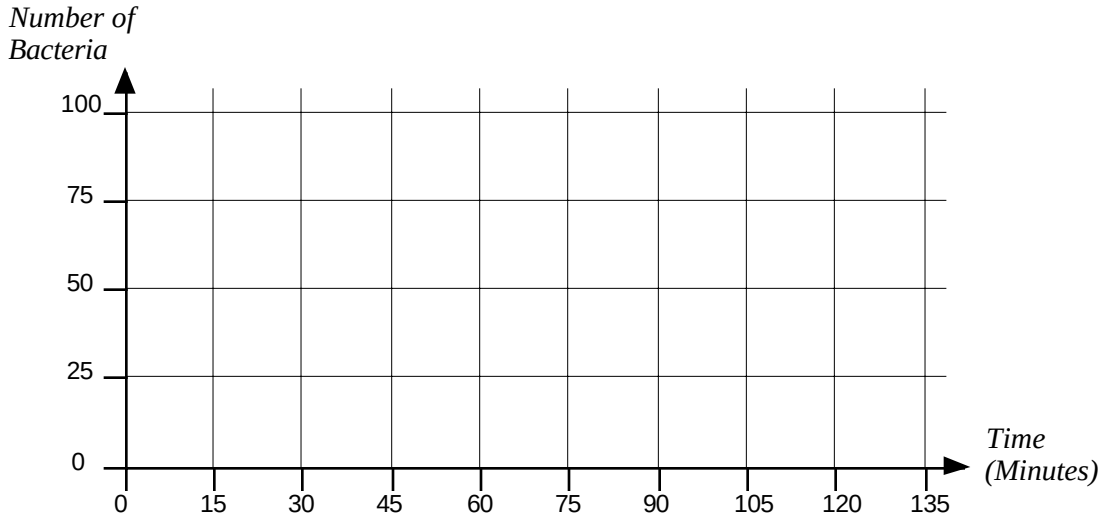


Figure 1: Photographs of a colony of *Streptococcus pneumoniae* growing under laboratory conditions. (Source: `http://www.cellsalive.com`)

- ***Using the axes provided, make a plot showing the number of bacteria in the colony at as a function of time.***



- ***Graphs with the appearance of your plot can often be described by equations of the form:***

$$N = A \cdot B^t$$

where N is the number of bacteria, t is the time and A and B are both constants. Experiment with some different values of A and B until you come up with values that agree (approximately) with the data points in your plot.

Table 1 gives some additional data collected about the colony of Streptococcus pneumoniae cells.

Time (minutes)	0	24	48	72	96	120	144	168	192	216	240	264	288
Number of Bacteria				16	30	52	84	119	150	172	185	192	196

Table 1: Additional data for the growth of the colony of *Streptococcus pneumoniae*.

- ***If you were a medical doctor who was treating people infected with a bacterial disease, how could you use information in the graph of number of bacteria versus time to decide whether the patient was just at the beginning of the infection, or whether the patient had been infected for some time?***