

Subject n°23 – Sequences and calculus.

Please, don't write on the exam paper and give it back at the end of the test.

Here is a passage from the book « THE ANDROMEDA STRAIN » by Michael Crichton :

« The mathematics of uncontrolled growth are frightening. A single cell of the bacterium *Escherichia Coli* would, under ideal circumstances, divide every twenty minutes. That is not particularly disturbing until you think about it, but the fact is that bacteria multiply geometrically : one becomes two, two become four, four become eight, and so on. In this way, it can be shown that, in a single day, one cell of *Escherichia Coli* could produce a super-colony equal in size and weight to the entire planet earth. »

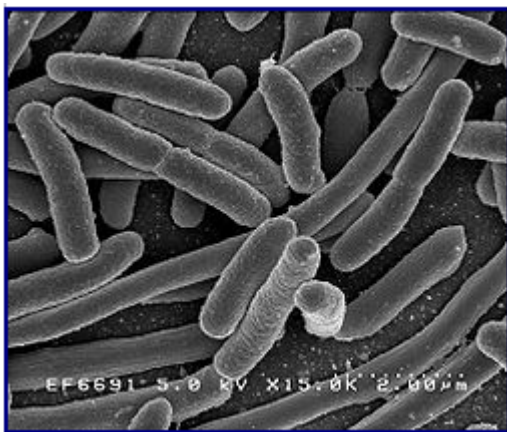
Question : Is this claim right concerning the volume ?

In order to help you, there is some information below.

* The length of the equator is about 40,000 km.

* **From Wikipedia :**

Escherichia Coli (abbreviated *E. coli*; named after [Theodor Escherich](#)-1885) is commonly found in the lower [intestine](#) of [warm-blooded](#) organisms. Most *E. coli* [strains](#) are harmless, but some can cause serious [food poisoning](#) in [humans](#). The harmless strains are part of the [normal flora](#) of the [gut](#), and can benefit their hosts by producing [vitamin K₂](#), and by preventing the establishment of [pathogenic](#) bacteria within the intestine.



zoom : x 1500

Cells are typically rod-shaped, a cell volume is about $0.6 - 0.7 (\mu\text{m})^3$.

vocabulary :

strain : souche

gut : intestin