# Colony Count with Serial Dilution

## Remember

1 $cm^3$ into 9$cm^3$ of distilled water/broth is a 10 fold dilution = $10^{-1}$ dilution factor

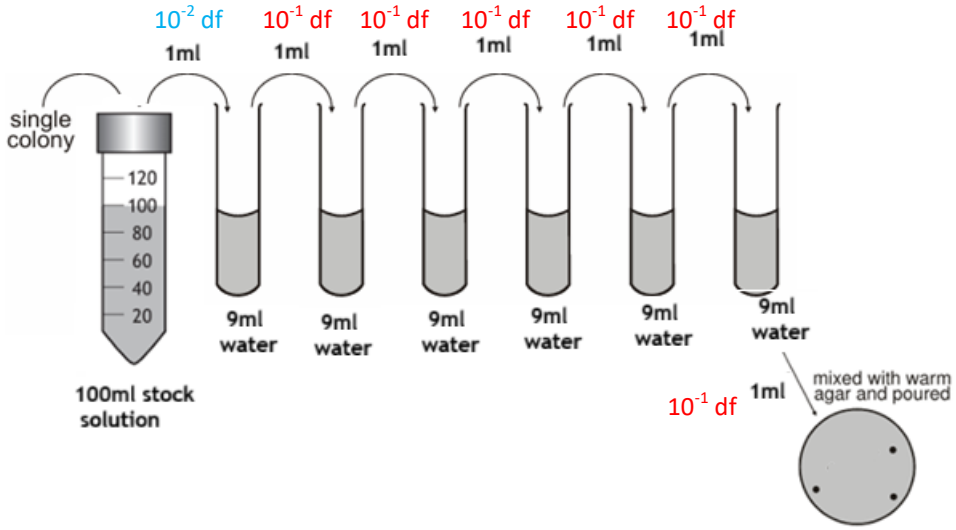
1 $cm^3$ into 99.9$cm^3$ of distilled water/broth is a 100 fold dilution = $10^{-2}$ dilution factor

0.1 $cm^3$ into 9.9$cm^3$ of distilled water/broth is a 100 fold dilution = $10^{-2}$ dilution factor

0.1 $cm^3$ into 99.9$cm^3$ of distilled water/broth is a 1000 fold dilution = $10^{-3}$ dilution factor

Worked Example 1

The figure shows how a biologist used serial dilution followed by plating the estimate the number of cells in a 100ml stock solution of E.coli




Total dilution factor = $10^{-2} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-1} = 10^{-8}$ **dilution factor**

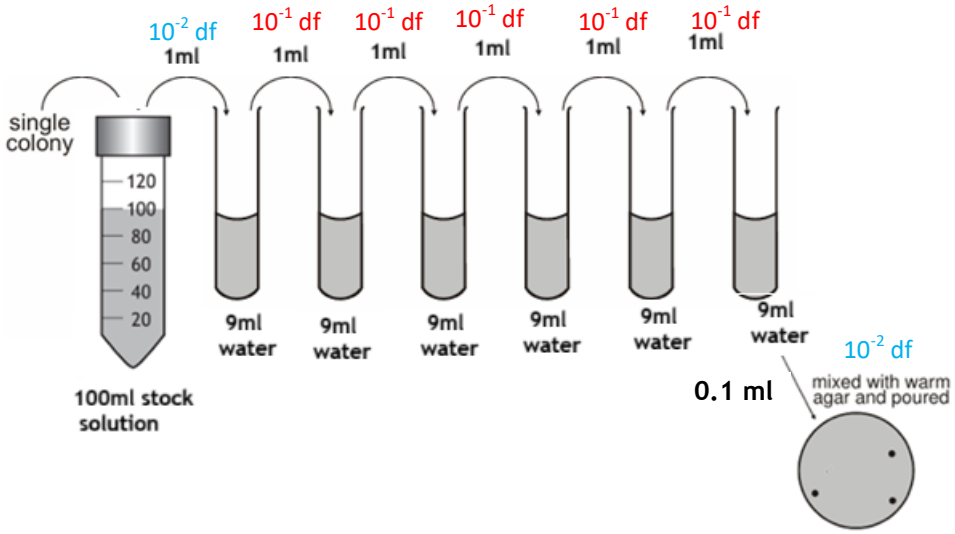
$10^{-8}$ df ⟶ 3 colonies

Original stock ⟶ **3 x $10^{8}$ OR 3 00 000 000 colonies**

# Colony Count with Serial Dilution

Worked Example 2

The figure shows how a biologist used serial dilution followed by plating the estimate the number of cells in a 100ml stock solution of E.coli




Total dilution factor = $10^{-2} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-2} = 10^{-9}$ **dilution factor**

$10^{-9}$ df ⟶ 3 colonies

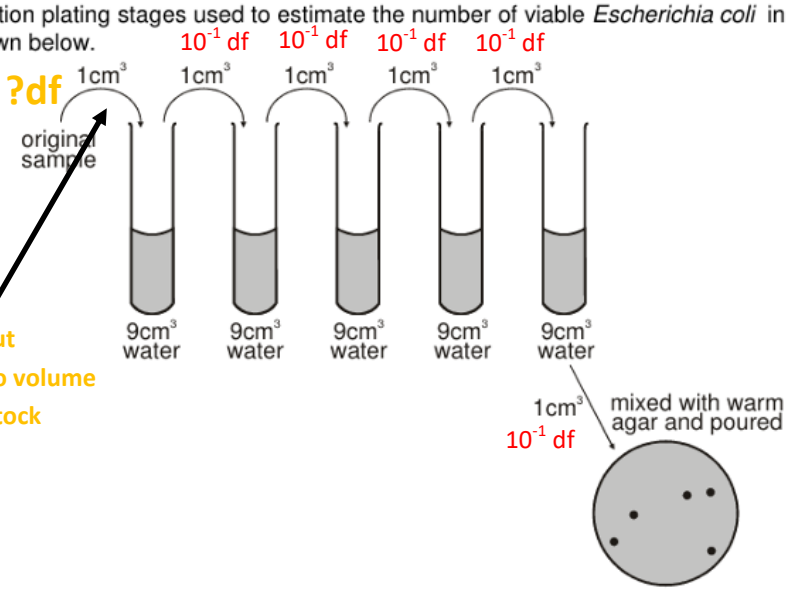
Original stock ⟶ **3 x $10^{9}$ OR 3 000 000 000 colonies**

# Colony Count with Serial Dilution

## Worked Example 3

In microbiology, the total cell count can be estimated by measuring turbidity, using a haemocytometer or by flow cytometry. These methods cannot distinguish between living and dead cells. To estimate the number of viable cells, dilution plating is used. 1

The dilution plating stages used to estimate the number of viable *Escherichia coli* in a culture are shown below.




Can't work out initial df as no volume of bacterial stock

Which of the following is the estimated number of *E. Coli* per cm³ in the original sample?

A 5 x $10^5$
B 1 x $10^6$
C 5 x $10^6$
D 1 x $10^7$

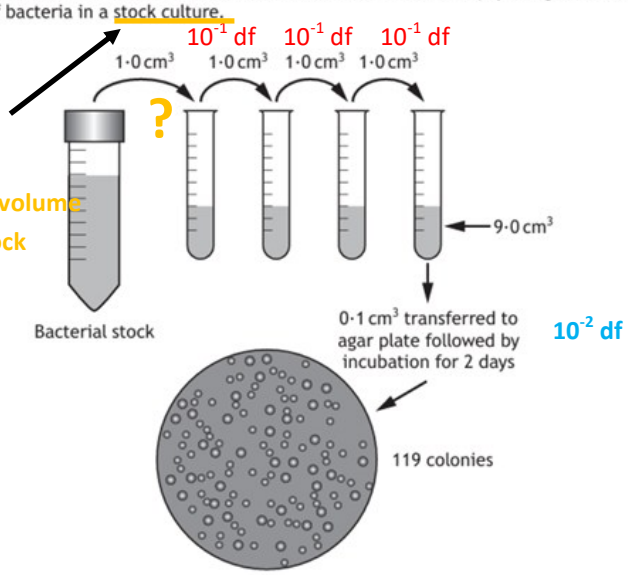
$10^{-1}$ + $10^{-1}$ + $10^{-1}$ + $10^{-1}$ + $10^{-1}$ = **$10^{-5}$ dilution factor**

$10^{-5}$ df → 5 colonies

Test tube 1 → 5 x $10^5$ OR 5 00 000

## Worked Example 4

The figure shows how a scientist used serial dilution followed by plating to check the number of bacteria in a stock culture.




Can't work out initial df as no volume of bacterial stock

How many bacteria were there in 1 cm³ of the original bacterial stock?

A 1·19 × $10^5$
B 1·19 × $10^6$
C 1·19 × $10^7$
D 1·19 × $10^8$

Total = $10^{-1}$ + $10^{-1}$ + $10^{-1}$ $10^{-2}$ = **$10^{-5}$ dilution factor**

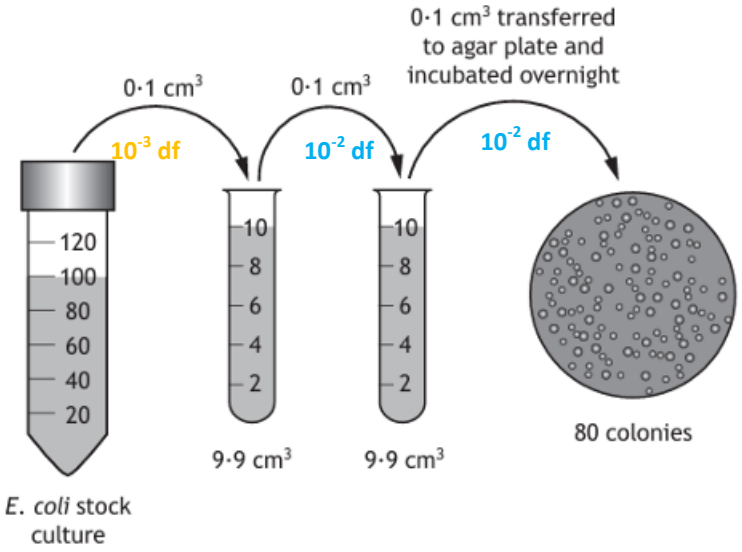
$10^{-5}$ df → 119 colonies

Test tube 2 → 119 x $10^5$ OR 1.19 x $10^7$ OR 11 900 000

# Colony Count with Serial Dilution

## Worked Example 5

The figure shows how a biologist used serial dilution followed by plating to estimate the number of cells in a 100 $cm^3$ stock culture of *E.coli*.




How many *E.coli* cells were present in the original stock culture?

A $8{\cdot}0 \times 10^4$

B $8{\cdot}0 \times 10^6$

C $8{\cdot}0 \times 10^7$

D $8{\cdot}0 \times 10^8$

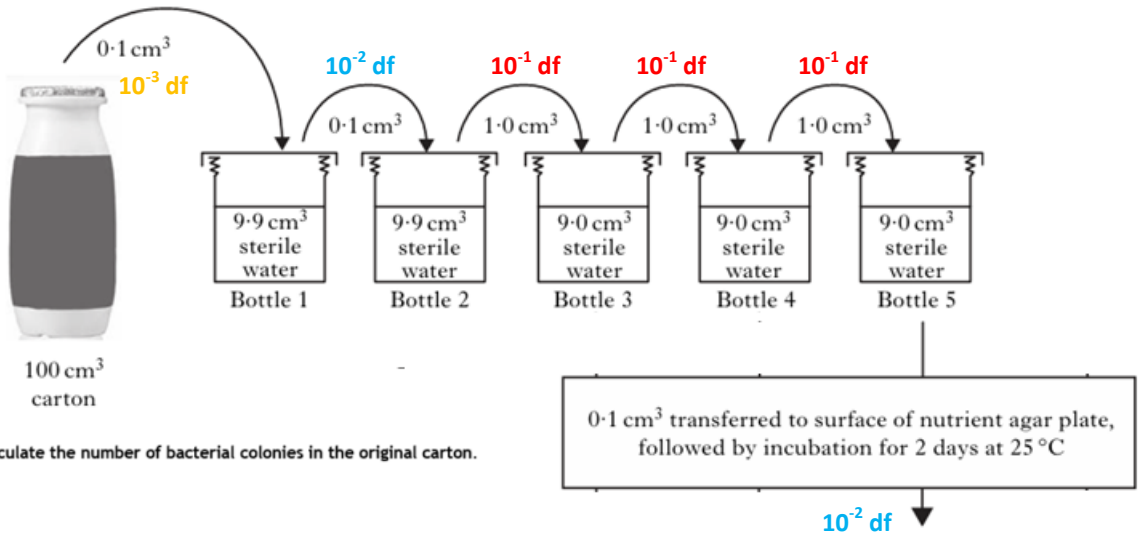
$10^{-3} + 10^{-2} + 10^{-2} = 10^{-7}$ dilution factor

$10^{-7}$ df ⟶ 80 colonies

Ecoli Stock culture ⟶ $80 \times 10^7$ OR $8 \times 10^8$ OR 800 000 000

## Worked Example 6

The Figure shows how a biotechnologist used dilution plating to check the number of bacteria in a 100 $cm^3$ carton of the drink.




Calculate the number of bacterial colonies in the original carton.

$10^{-3} + 10^{-2} + 10^{-1} + 10^{-1} + 10^{-1} + 10^{-2} = 10^{-10}$ dilution factor

$10^{-10}$ df ⟶ 60 colonies

Ecoli Stock culture ⟶ $60 \times 10^{10}$ OR $6 \times 10^{11}$ OR 600 000 000 000