Volume of distribution
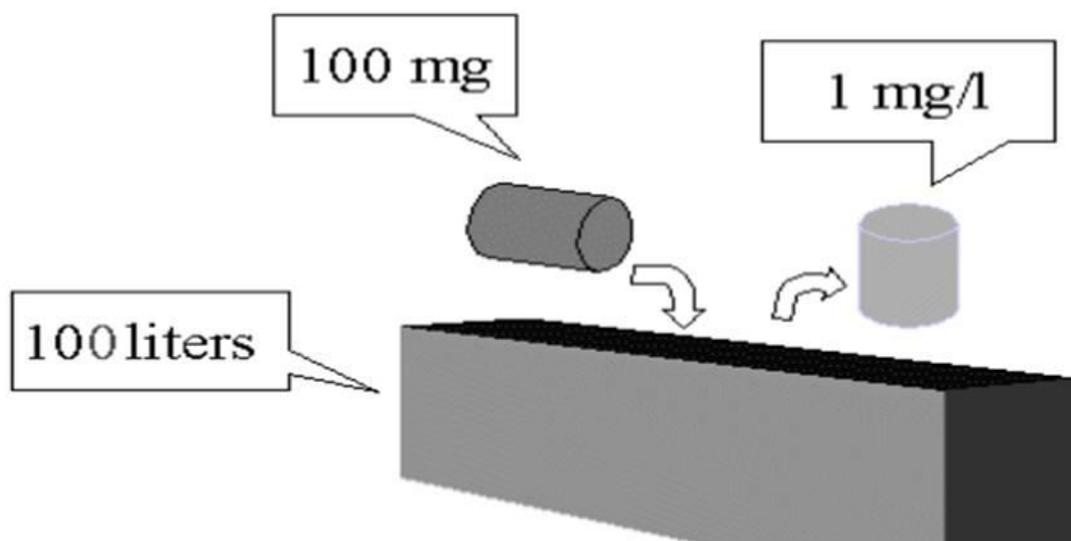
- Volume of distribution (Vd) of drug:

- Vd means the amount of fluid in which the administered drug is distributed.

- The **Volume of distribution** (V_D), also known as **Apparent volume of distribution**, is used to quantify the distribution of a drug between plasma and the rest of the body after oral or parenteral dosing.

- It is called as Apparent Volume because all parts of the body equilibrated with the drug do not have equal concentration.

$$Vd = \frac{\text{Dose of the drug given (Q)}}{\text{Concentration of drug in plasma (Cp)}}$$

So, if Dose given: 100mg &

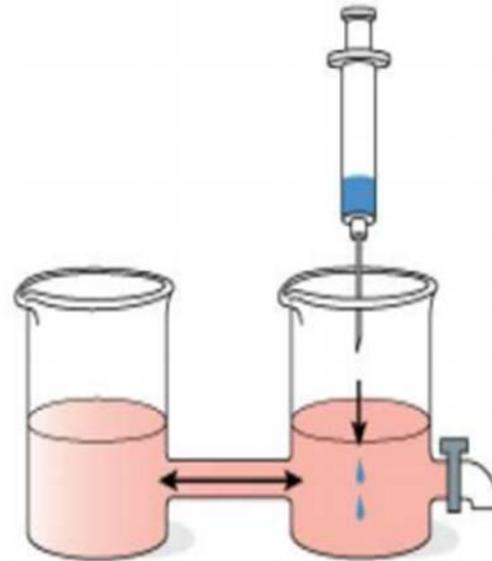C_p : 1mg/L {C_p is the plasma concentration }

Then,

$Vd = Dose/ C_p$

$Vd = 100/1 = 100$ L

Fluid/water compartments in the body
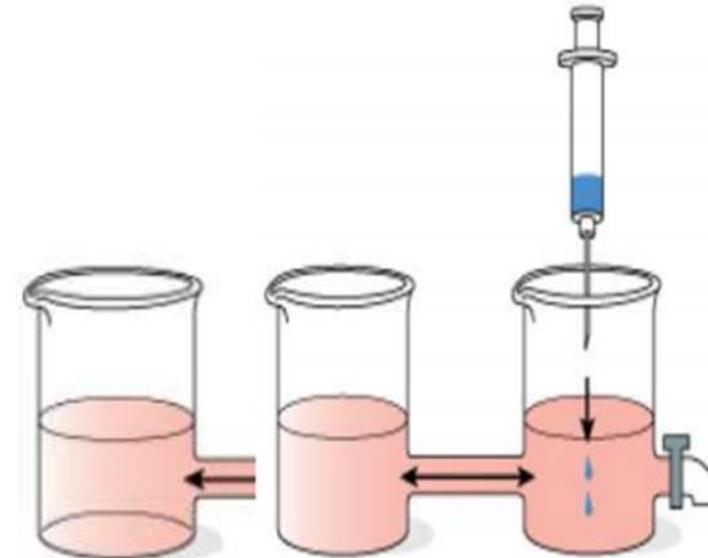
Blood/
Plasma

4 L

Interstitial
fluid

10 L

Blood/
Plasma

4 L

_____
14 L

Extracellular fluid/water

Intracellular
fluid
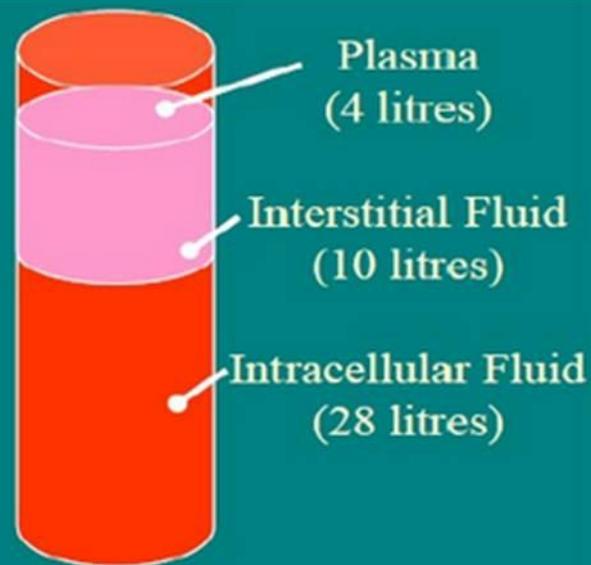
28 L

Interstitial
fluid

10 L

Blood/
Plasma

4 L

_____
42 L

Total body fluid/water

Drugs may distribute into any or all of the following compartments:

- Plasma
- Interstitial Fluid
- Intracellular Fluid

Total Body Fluid = 42 L (approx.)

Plasma (4 litres)

Interstitial Fluid (10 litres)

Intracellular Fluid (28 litres)

- Volume distribution of heparin 4L means?

- It means heparin distributes about 4 liters of body fluid.

- So it remains in only 1 compartment, that is blood.

- Why so small volume of distribution?
- Because, Heparin has-
- Very large molecular weight.
- Extensive plasma protein binding.

- Volume distribution of Aminoglycosides is 14 liter means?

- This drug has a low molecular weight but is hydrophilic.
- So, it can move through the endothelial gap junctions of the capillaries into the interstitial fluid.
- It distribute into (plasma water + interstitial fluid) = extracellular fluid (14 liters)

- Why ethanol has high volume of distribution (60% total body water 42L)?

- Ethanol is a drug has a low molecular weight and is hydrophobic, so can it move into the Plasma+ Interistitium + cell.