Properties of Exponentially Large #'s

1. Exponentially Large numbers like e^{N_A} are so large that even their logarithm is large, $\ln e^{6\times10^{23}} = 6\times10^{23}$, while $\ln 6\times10^{23} \simeq 54$. To interpret such numbers always

take the log of the number!

2. Multiplying an exponentially large # by an ordinary number, like a million, or 10^{-6} doesn't change its value significantly

$$e^{N_A}\cdot 10^6 = e^{N_A} e^{6\cdot\ln 10} = e^{6\times10^{23}+13.8} \simeq e^{6\times10^{23}} \simeq e^{N_A}$$

In terms of logs of this number $\log(e^{N_A}\cdot 10^6)$ is

$$N_A + 6\ln 10 \simeq N_A + 13.8 \simeq N_A$$

3. Now if you have sum of exponentially large numbers only the largest is important

$$\text{Sum} = e^{6\times10^{23}} + e^{5.99999\times10^{23}}$$

this is huge but way smaller than the first

$$= e^{6\times10^{23}}\left(1 + \underbrace{e^{-0.00001\times10^{23}}}_{e^{-10^{18}}}\right)$$

⇐ that's small!

$$\simeq e^{6\times10^{23}}$$