$$\frac{\partial \rho}{\partial t} = D \cdot \frac{\partial^2 \rho}{\partial x^2} + c \cdot \rho(x,t)$$

For Reflecting Boundary Condition, for domain $x \in [0, L]$

$$\left.\frac{\partial \rho}{\partial x}\right|_{x=0} = \left.\frac{\partial \rho}{\partial x}\right|_{x=L} = 0$$

$$\rho(x,0) = \delta(x)$$

Now, Let, $\rho = X(x) \cdot T(t)$

From separation of variable,

$$\frac{\partial T}{\partial t} = -KDt$$

$$\Rightarrow T(t) = e^{-KDt}$$

And, $\frac{\partial^2 X}{\partial x^2} = -(K + C/D)X$

If, we consider, $K + C/D = p^2$, we find,

$\frac{\partial^2 X}{\partial x^2} + p^2 X = 0$, which has a general sol^n

$$X(x) = A \cos px + B \sin px$$

Now, $\frac{\partial X}{\partial x} = -Ap \sin px + Bp \cos px$

with, $\left.\frac{\partial X}{\partial x}\right|_{x=0} = 0$, we get. $B = 0$.

And, with. $\left.\frac{\partial X}{\partial x}\right|_{x=L} = 0$.

$$-Ap \sin pL = 0.$$

$$\Rightarrow \sin pL = 0$$

$$\Rightarrow pL = n\pi$$

$$\therefore \quad p = n\pi/L$$

So, we get. $X(x) = \cos\left(\frac{n\pi}{L}\right)x$ [Taking, A = 1]

Here, $(K + C/D) = p^2$

$\Rightarrow K = \left(\frac{n\pi}{L}\right)^2 - C/D$

For the chain reaction to occur

$-K > 0$

i.e. K needs to be negative.

That means, $T(t) = e^{-KDt}$ has a positive power of exponential.

So, as large time is considered $T(t)$ always diverges and so does $\rho(x,t)$.

Therefore, for reflecting boundary conditions, the neutron density will always diverge for large time; i.e. there is no critical mass

[Shown.]