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Quiz 9

NPRE 247

1) M fuel: 18.698 kg

2) A thermal neutron is a neutron which has already been slowed down from the time it was born to now interact and be absorbed by Uranium atoms without hitting a resonance speed.

3) A Maxwell distribution can be seen

Code

In [1]:
```
from sympy import *
import numpy as np
```

```
1. Last week, the IAEA notified member states that 2.5 tonnes of uranium ore were missing from a site in Libya. Assuming this ore has natural abundances of U isotopes and is comprised of pure UO2, how much uranium oxide enriched to a mass to 95% 235U could this stockpile produce?
```

In [21]:
```
#Constants
N_A = 6.02214179e23

#Mass
m_O = 15.9994

m_U235 = 235.043930
m_U238 = 238.050788
m_U = 238.90765

#Natural Atom Percents
ap_U235 = .7204 / 100
ap_U238 = 99.2724 / 100
```

In [24]:
```
#1
mass = 2.5 * 1000 * 1000 #tonnes * kg/tonne * g/kg

m_UO2 = m_U + (2 * m_O)

mass_U = mass * (m_U / m_UO2)
atoms_U = mass_U / m_U * N_A #g / g/mol * atoms/mol

atoms_U235 = ap_U235 * atoms_U
mol_U235 = atoms_U235 / N_A #atoms / atoms/mol

mol_total = mol_U235 / .95
mol_O = 2 * mol_total
mol_U238 = .05 * mol_total

mass_fuel = ((mol_U238 * m_U238) + (mol_U235 * m_U235)) + (mol_O * m_O)
print('M fuel [kg]', mass_fuel / 1000)
```