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THE IMPORTANCE OF USING AND SAVING WATER RESOURCES

Water plays a central role in economic and social development; it is vital to maintain health, grow food, manage the environment, and create jobs. Despite its significance, water resources face increasing threats from pollution, overexploitation, and climate change. But, a staggering 2 billion people worldwide lack access to safely managed drinking water, and 3.6 billion people lack access to safely managed sanitation. A lack of clean water and proper sanitation facilities spreads diseases, with millions of deaths each year linked to contaminated water sources. The scarcity of water has emerged as one of the most pressing issues confronting humanity. When water is scarce or polluted, or when people have unequal, or no access to water, tensions can rise between communities and countries. [2,3,5]

Something needs to be done to either render waterusage more effective or make more water available. There is an urgent need, within and between countries, to unite around protecting and conserving our most precious resource [1,4]

Conserving water contributes to environmental preservation by lowering the energy needed for processing and distributing water to households, businesses, farms, and communities, thereby aiding in the reduction of pollution and the conservation of fuel resources. [5]

By using water-saving techniques, we can divert less water from rivers, bays, and estuaries, which helps preserve aquatic ecosystems. It also reduces water and wastewater treatment costs and the amount of energy used to treat, pump, and heat water, thus lowering energy demand and preventing air pollution. [5]

We must act upon the realization that water is not only a resource to be used and competed over – it is a human right, intrinsic to every aspect of life.[3]

By promoting knowledges, fostering collaboration, and implementing evidence-based policies, societies can ensure the availability and accessibility of water resources for future generations.

Responsible water usage is not only a local concern but also a global imperative. It is common knowledge that there is urgent necessity to safeguard our planet’s freshwater resources for generations to come.

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PHYSICAL PROPERTIES OF NEUTRONS

Neutrons are one of the fundamental building blocks of matter, making up roughly 50% by weight of all material. Only when they are released from atomic nuclei do they constitute a hazardous form of radiation, and there are only two processes that can achieve this separation and produce ‘free’ neutrons: a nuclear reaction and spontaneous fission.

Free neutrons are unstable and have a lifetime of 886 s, decaying by emitting an electron and an antineutrino to become a proton. Neutrons have a magnetic moment, and although quite small, it has a value. Represented by the symbol $_{\mu n}$, its value is $-0.96623640 \times 10^{-26}$ $J \cdot T^{-1}$, which is approximately 1/1000th of the electron magnetic moment. So, although the neutron is usually thought of as a particle without charge that interacts as though it were a billiard ball, it can be seen that neutrons are more complex entities.

The neutron has a spin of 1/2, and the mass of the neutron is 1.675×10^{-27} kg, which is slightly larger than that of the proton. Neutrons are present in every atomic nucleus with the exception of hydrogen (^{1} H). Neutrons can interact by means of the four common forces: strong nuclear, weak nuclear, electromagnetic (because of their magnetic moment) and gravitational.

Neutrons may be generated by a number of processes, including photoneutron reactions, wherein a high energy gamma ray incident on a high Z target generates neutrons; charged particle interactions, such as a proton impinging on a tritium target; or spontaneous fission in heavy elements. Generally, neutrons are produced with high energies at least above 10 keV, and potentially above 10 MeV, and these fast neutrons are slowed by collisions in matter. These collisions may be elastic, inelastic or non-elastic, and only a small amount of energy may be lost in each collision, and so it will take many collisions to reduce the neutron energy to a low value. Eventually the neutrons will slow to the point where they come to be in thermal equilibrium with the medium through which they are passing, and their distribution of velocities will have a most probable value at 20°C of 2200 $m \cdot s^{-1}$, which corresponds to a neutron energy of 0.0253 eV. Generally, neutrons whose energies are below the sharp drop in the absorption cross-section in cadmium at ~0.4 eV are referred to as thermal neutrons.

When neutrons interact with matter, they undergo a number of collisions with atoms and may be considered to be acting like gas molecules that eventually come into thermal equilibrium with their surroundings. In order to evaluate the most probable distribution of neutron velocities after they have come to equilibrium, a Maxwellian distribution can be assumed.

The kinetic energy distribution of neutrons in thermal equilibrium with their surroundings at temperature T (K) may be written as

$$\frac{n(E)dE}{n} = 2\Big/\sqrt{\pi}\sqrt{\frac{E}{kT}}\exp\left(\frac{E}{kT}\right)d\left(\frac{E}{kT}\right) \quad (1)$$