

1. Nano-Technology is an "enabling technology" which influences a wide range of products and processes with far-reaching implications for development. Discuss the applications of nano-technology in water purification and food processing sector and how can it contribute for societal development?

Answer:

- Nanotechnology is the study of matter at a miniature level called the nano scale. Nanomaterials have unique size-dependent properties related to their high specific surface area (fast dissolution, high reactivity, strong sorption) and discontinuous properties.
- These specific nano-based characteristics allow the development of novel high-tech materials for more efficient water and wastewater treatment processes, namely membranes, adsorption materials, nano-catalysts, functionalized surfaces, coatings, and reagents. Both Carbon nanotubes CNTs and nano-metals are highly effective nano-adsorbents for the removal of heavy metals such as arsenic.
- With respect to food processing, Nanomaterials allow better encapsulation and release efficiency of the active food ingredients compared to traditional encapsulating agents.
- Silicate nano-particles are used to provide a barrier to gasses (for example oxygen), or moisture in a plastic film used for packaging. This could reduce the possibility of food spoiling or drying out.
- Zinc oxide nano-particles can be incorporated into plastic packaging to block UV rays and provide anti bacterial protection, while improving the strength and stability of the plastic film.
- Nanosensors are being developed that can detect bacteria and other contaminants, such as salmonella, at a packaging plant. This will allow for frequent testing at a much lower cost than sending samples to a lab for analysis.
- Nanotechnology may allow us to build a sustainable, society-focused technology through upfront design rather than retroactive problem solving, use of molecular medicine and personalized health treatment, increased productivity, and early and continuing emphasis on multidisciplinary education.

PRACTICE QUESTIONS

Answer the following Questions

1. India produces enough food for its people, but not all people get enough food to eat. Discussing this paradox, highlight some of the major interventions taken in the past few years in this regard. (150 words)
2. India sees Indian Ocean as not just a water body, but a global stage for continued economic, social, and cultural dialogue. Elaborate. (150 words)