Science & Technology · GS - III

What do you understand by nanotechnology and how is it helping in health sector?

EXAM YEAR	PAPER	SUBJECT
2020	GS - III	Science & Technology

MARKS	WORD LIMIT
10	~150 words

Answer Hint

Nanoscale materials; targeted drug delivery; diagnostics; medical imaging; cancer treatment; antimicrobial applications; biosensors; safety concerns; regulation and research

Model Answer

Introduction

Nanotechnology involves manipulating materials and structures at the nanoscale, generally around 1–100 nanometres, to obtain useful physical, chemical or biological properties. It has growing applications in diagnosis, treatment and disease prevention.

Applications in healthcare

- **Targeted drug delivery:** Nanoparticles can transport medicines towards specific tissues, potentially improving treatment effectiveness and reducing side effects.
- **Cancer treatment:** Nanotechnology supports targeted delivery of anticancer drugs and research into improved tumour imaging and treatment.
- **Diagnostics:** Nanosensors and nanomaterials can improve the sensitivity of tests for selected diseases and biomarkers.
- **Medical imaging:** Nanoparticles may enhance contrast in imaging techniques, supporting more precise diagnosis.
- **Antimicrobial applications:** Certain nanomaterials are investigated for antimicrobial coatings and infection-control applications.

- **Regenerative medicine:** Nanostructured materials can support research on tissue engineering and wound healing.
- **Vaccines and therapeutics:** Nanotechnology-based delivery systems have contributed to advances in some vaccines and medicines.

Challenges

Potential toxicity, environmental effects, manufacturing costs and uncertainties about long-term safety require rigorous testing. Regulatory oversight and evidence-based clinical evaluation are essential.

Conclusion

Nanotechnology can improve the precision and effectiveness of healthcare, from early diagnosis to targeted treatment. Its benefits depend on affordable access, strong safety standards and sustained scientific research.

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