Science & Technology · GS - III

India's transition from technology adoption to technology leadership requires more than increased investment in research and development. Examine the institutional, industrial and human-capital requirements for achieving this transition.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Technological sovereignty, R&D expenditure, semiconductor ecosystem, AI infrastructure, quantum technology, academia-industry collaboration, skilled workforce, intellectual property, inclusive innovation.

Model Answer

Introduction

Rapid technological transformation is reshaping economic competitiveness and national security. For India, technological leadership requires moving beyond technology adoption towards indigenous innovation and commercialisation.

Institutional Requirements

Stable research funding, effective intellectual property protection, university-industry collaboration and regulatory clarity are essential. Strong research institutions must be connected with domestic enterprises to convert scientific discoveries into practical applications.

Industrial Requirements

India needs capabilities across semiconductor design, fabrication, advanced packaging, AI computing infrastructure and quantum technologies. Diversified supply chains, reliable electricity and access to critical materials are equally important to reduce external vulnerabilities.

Human Capital and Inclusion

Developing specialised skills through higher education, vocational training and research fellowships is crucial. Innovation must also address public needs in healthcare, agriculture, education and governance rather than remaining concentrated in a few technology-intensive sectors.

Conclusion

India's technological leadership depends on integrating research, manufacturing, skilled human resources and inclusive deployment. A coordinated innovation ecosystem can strengthen strategic autonomy while improving citizens' quality of life.

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