Science & Technology · GS - III

Advanced semiconductor technologies have emerged as strategic assets in global economic and geopolitical competition. Examine the national security challenges associated with protecting critical technology ecosystems.

EXAM YEAR	PAPER	SUBJECT
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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Semiconductor supply chains, artificial intelligence, technology theft, corporate espionage, export controls, intellectual property, cybersecurity, strategic autonomy, international cooperation.

Model Answer

Introduction

Semiconductors are essential to artificial intelligence, telecommunications, defence and modern industries. Their strategic importance has made technological capabilities a major dimension of global geopolitical competition.

Major National Security Challenges

- **Corporate espionage:** Unauthorised acquisition of research and proprietary information can undermine technological advantages.
- **Supply-chain dependence:** Concentration of manufacturing and critical materials creates vulnerabilities during geopolitical disruptions.
- **Cybersecurity threats:** Attacks on research institutions and technology firms may expose sensitive designs and data.

- **Technology restrictions:** Export controls and geopolitical rivalry can restrict access to advanced chips and manufacturing equipment.
- **Insider threats:** Individuals with privileged access may compromise confidential technological information.

Measures for India

India should strengthen semiconductor research, domestic manufacturing and skilled manpower development. Robust cybersecurity, intellectual property protection, personnel screening and trusted international partnerships are equally important.

Conclusion

Protecting critical technologies requires a comprehensive approach combining innovation, industrial resilience and national security safeguards. India must reduce strategic dependencies while remaining integrated with global technology ecosystems.

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