Science & Technology · GS - III

The global semiconductor industry has emerged as a strategic sector where technological leadership, corporate governance and national security increasingly intersect. Examine its significance and the challenges associated with excessive dependence on a few technology companies.

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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Semiconductor value chain, AI revolution, technological sovereignty, supply-chain concentration, corporate governance, export controls, geopolitical competition, research and development, India's semiconductor mission, diversification.

Model Answer

Introduction

Semiconductors are fundamental to modern digital economies. Their applications in artificial intelligence, telecommunications, automobiles, healthcare and defence make the industry strategically important for economic and national security.

Strategic Significance

1. **Technological leadership:** Advanced chips enable high-performance computing, AI development and next-generation communication systems.
2. **Economic competitiveness:** Semiconductor capabilities support industrial productivity, innovation and high-value employment.
3. **National security:** Dependence on foreign chip technologies can create vulnerabilities in critical infrastructure and defence systems.
4. **Geopolitical influence:** Export controls and technological restrictions have made semiconductor supply chains an important instrument of international competition.

Major Challenges

Concentration of advanced manufacturing and critical technologies among a limited number of companies and geographical regions creates supply-chain risks. High capital requirements, specialised skills, intellectual property concerns and geopolitical disruptions further complicate diversification. Weak corporate governance can also affect investor confidence and technological partnerships.

Way Forward

India should strengthen semiconductor manufacturing, research and development, skilled human resources, domestic design capabilities and international partnerships. Transparent corporate governance and diversified supply chains are equally important.

Conclusion

Semiconductor resilience requires cooperation between governments, industry and research institutions. Technological self-reliance should be pursued alongside global integration and innovation.

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