Science & Technology · GS - III

Concentration of critical semiconductor and artificial intelligence capabilities in a limited number of companies and countries creates strategic vulnerabilities in the global economy. Analyse the implications for India's technological sovereignty.

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MARKS	WORD LIMIT
10	~150 words

Answer Hint

Semiconductor concentration, AI infrastructure, supply-chain disruption, export controls, technological sovereignty, China-US competition, India Semiconductor Mission, domestic R&D, international partnerships.

Model Answer

Introduction

Semiconductors are foundational to artificial intelligence, telecommunications, defence and modern manufacturing. Their concentrated supply chains create economic and strategic vulnerabilities.

Strategic Implications

Dependence on a few firms for advanced chips exposes countries to geopolitical tensions, export restrictions and supply disruptions. Concentration of AI computing infrastructure can also create market dependence and limit technological autonomy. US-China competition illustrates how semiconductor capabilities have become instruments of strategic influence.

Challenges for India

India remains dependent on imported advanced chips and specialised manufacturing equipment. Limited fabrication capabilities, high capital requirements, technology gaps and shortages of skilled personnel constrain domestic production.

Way Forward

The India Semiconductor Mission should be supported through sustained research, domestic fabrication, chip design, advanced packaging and workforce development. Diversifying international partnerships and strengthening trusted supply chains can reduce external vulnerabilities.

Conclusion

Technological sovereignty does not require complete self-sufficiency. India must build critical domestic capabilities while integrating strategically with diversified global semiconductor networks.

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