Science & Technology · GS - III

Examine how semiconductor capabilities and artificial intelligence are becoming instruments of technological competition and strategic power in international relations.

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MARKS	WORD LIMIT
15	~250 words

Answer Hint

Semiconductor supply chains, AI computing, technological sovereignty, export controls, US-China rivalry, strategic autonomy, domestic manufacturing

Model Answer

Introduction

Artificial intelligence and advanced semiconductors are increasingly central to economic competitiveness, national security and geopolitical influence. Control over critical technologies enables countries to shape global innovation and strategic relationships.

Technology as an Instrument of Strategic Power

1. **Economic competitiveness:** Advanced semiconductors power AI, telecommunications, automobiles and defence systems, making chip capabilities essential for industrial growth.

2. **Geopolitical influence:** Restrictions on advanced chip exports and semiconductor manufacturing equipment can limit the technological capabilities of competing countries.

3. **Supply-chain security:** Dependence on a limited number of manufacturers creates vulnerabilities during geopolitical conflicts, trade restrictions and production disruptions.

4. **Corporate influence:** Technology companies and their leadership influence investment decisions, innovation priorities and national technological strategies.

5. **National security:** AI-enabled intelligence, autonomous systems and advanced computing have significant implications for military preparedness and cybersecurity.

Challenges for India

1. Limited domestic capabilities in advanced semiconductor fabrication.
2. Dependence on imported equipment, materials and specialised technologies.
3. Shortages of highly skilled semiconductor and AI professionals.
4. Exposure to global supply-chain disruptions and technology restrictions.

Way Forward

1. Strengthen semiconductor manufacturing through the India Semiconductor Mission.
2. Promote indigenous research, chip design and advanced packaging.
3. Develop specialised AI and semiconductor skills through academia-industry partnerships.
4. Diversify international technology partnerships while protecting strategic interests.
5. Establish robust corporate governance and succession planning to reduce key-person risks.

Conclusion

Technological sovereignty does not require complete self-sufficiency. India must build strategic domestic capabilities, diversify global partnerships and strengthen innovation ecosystems to become a resilient participant in the emerging technology order.

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