Science & Technology · GS - III

Advanced semiconductor technologies have emerged as instruments of geopolitical competition, linking artificial intelligence development with national security and economic sovereignty. Analyse the implications of technology export controls for global supply chains and India's semiconductor ambitions.

EXAM YEAR	PAPER	SUBJECT
DAILY PRACTICE 12/11/2026	GS - III	Science & Technology

MARKS	WORD LIMIT
10	~150 words

Answer Hint

AI computing infrastructure, advanced GPUs, US-China technology competition, export controls, strategic autonomy, semiconductor supply-chain concentration, domestic manufacturing, India Semiconductor Mission, research and development, international partnerships, technology security.

Model Answer

Introduction

Advanced semiconductors are critical to artificial intelligence, telecommunications, defence and modern industrial systems. Their strategic importance has intensified geopolitical competition and technology-related trade restrictions.

Global Implications

Export controls on advanced chips can restrict access to computing infrastructure and influence the technological capabilities of competing countries. Such restrictions encourage domestic innovation but may also fragment global supply chains, increase costs and create technological blocs. Dependence on a limited number of manufacturers exposes countries to geopolitical disruptions.

Implications for India

India's semiconductor ambitions offer opportunities to strengthen technological sovereignty, attract investment and develop high-value manufacturing. The India Semiconductor Mission seeks to build domestic fabrication, packaging and design capabilities. However, challenges include capital intensity, advanced equipment dependence, skilled workforce shortages and limited ecosystem depth.

Way Forward

India should expand research and development, develop semiconductor talent, diversify international partnerships and strengthen domestic component manufacturing. Predictable policies and strategic cooperation can improve supply-chain resilience.

Conclusion

Semiconductor security is increasingly linked to economic and national security. India must combine global integration with domestic capability-building to achieve sustainable technological autonomy.

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