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GENERAL STUDIES (TEST CODE : 2084)

Name of Candidate	KABIL BHARGAVA		
Medium Eng./Hindi	ENGLISH	Registration Number	
Center		Date	28/08/2023.

INDEX TABLE

Q. No.	Maximum Marks	Marks Obtained
1	10	
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3	10	
4	10	
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9	10	
10	10	
11	15	
12	15	
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16	15	
17	15	
18	15	
19	15	
20	15	

Total Marks Obtained:

Remarks:

INSTRUCTIONS

1. Do furnish the appropriate details in the answer sheet (viz. Name, Registration Number and Test Code).
   उत्तर पुस्तिका में सूचनाएं भरना आवश्यक है (नाम, प्रश्न–पत्र कोड, विद्यार्थी क्रमांक आदि)।
2. There are **TWENTY** questions printed in **HINDI & ENGLISH**
   इसमें बीस प्रश्न हैं **हिन्दी और अंग्रेजी** में छपे हैं।
3. **All questions are compulsory.**
   सभी प्रश्न अनिवार्य हैं।
4. The number of marks carried by a question/part is indicated against it.
   प्रत्येक प्रश्न/भाग के अंक उसके सामने दिए गए हैं।
5. Answers must be written in the medium authorized in the Admission Certificate, which must be stated clearly on the cover of this Question-Cum-Answer (QCA) Booklet in the space provided. No marks will be given for answers written in medium other that the authorized one.
   प्रश्नों के उत्तर उसी माध्यम में लिखे जाने चाहिए जिसका उल्लेख आपके प्रवेश पत्र में किया गया है और उस माध्यम का स्पष्ट उल्लेख प्रश्न–सह–उत्तर (क्यूसीए) पुस्तिका के मुख्य पृष्ठ पर अंकित निर्दिष्ट स्थान पर किया जाना चाहिए। उल्लिखित माध्यम के अतिरिक्त अन्य किसी माध्यम में लिए गए उत्तर पर कोई अंक नहीं मिलेंगे।
6. Word limit in questions, if specified, should be adhered to.
   प्रश्नों में शब्द सीमा, जहाँ विनिर्दिष्ट है, का अनुसरण किया जाना चाहिए।
7. Any page or portion of the page left blank in the Question-Cum-Answer Booklet must be clearly struck off.
   उत्तर पुस्तिका में खाली छोड़ा हुआ पृष्ठ या उसके अंश को स्पष्ट रूप से काटा जाना चाहिए।

EVALUATION INDICATORS

1. Contextual Competence
2. Content Competence
3. Language Competence
4. Introduction Competence
5. Structure - Presentation Competence
6. Conclusion Competence

Overall Macro Comments / feedback / suggestions on Answer Booklet:

1.

2.

3.

4.

5.

6.

All the Best

1. भारत ने हाल ही में अपना पहला जैविक डेटा केंद्र स्थापित किया है। इसके उद्देश्यों को रेखांकित करते हुए, इसके महत्व पर चर्चा कीजिए। (150 शब्दों में उत्तर दीजिए)
India has recently set up its first Biological Data Centre. Highlighting its objectives, discuss its significance. (Answer in 150 words) 10

India has setup it's first Biological data centre (BDC) at Research for Biological centre (RBC), Faridabad. enabling storage and processing of lifescience data capabilities

objectives of IBDC -

1) help in storage of lifescience data in secure manner.

2) provide access to researchers across the country by means of an IT platform

3) build infrastructure and knowledge Network related to biological data and lifscience in the country.

4) build a repository of human genomic

data in long run.

Significance of IBDC →

1) improve data collection methodology, standards and storage.

2) improve research in pharmaceutical sector → enabling drug discovery, new & effective products.

3) enabling precision medicine, nanobiotechnology development in India.

4) reduced reliance on foreign data centers.

Hence, Indian Biological data centre is set to usher in an era of improved lifescience research in the country, enabling us to become a world leader.

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2. राष्ट्रीय सुपरकंप्यूटिंग मिशन (NSM) के उद्देश्यों को रेखांकित करते हुए, इसकी अब तक की उपलब्धियों की विवेचना कीजिए। (150 शब्दों में उत्तर दीजिए)

Highlighting the objectives of the National Supercomputing Mission, discuss its achievements so far. (Answer in 150 words) 10

National Supercomputing (NSM) Mission was launched in 2015 to develop supercomputing capabilities and harness them for country's development.

objectives of NSM →

1) develop indigenous capabilities in supercomputer development.

2) improve research and development and efficiency of supercomputers by increasing speed (petaflops).

3) make available a skilled workforce in supercomputing capabilities.

4) develop industry-academia partnership

5) build a ~~knowledge~~ network of supercomputers grid in the country to boost collaboration.

achievements of NSM →

1) increased speed of supercomputers in India → Now 16 petaflops.

2) trained over 10000 professionals and faculties in supercomputing skills.

3) developed indigenous server = Rudra

4) increased indigenous content in supercomputer.

5) Now, 4 Indian supercomputers in top 500. ⇨ Pratyush, Mihir.

Hence, NSM has had tremendous achievements. Need to increase funding, R&D and indigenous development capability to gain more synergy.

3. 'ऑर्गन ऑन चिप्स' (OoCs) से आप क्या समझते हैं? औषध क्षेत्रक में क्रांति लाने की इनकी क्षमता पर टिप्पणी कीजिए। (150 शब्दों में उत्तर दीजिए)

What do you understand by 'Organ on Chips' (OoCs)? Bring out their potential in revolutionising the pharmaceutical sector. (Answer in 150 words) 10

'Organ on chips' refers to the revolutionary technology of use cells from body → integrating them into a microchip, so that they can function similar the the organ of the host organism.

Potential in pharmaceutical sector-

1) help in clinical trials of new drugs/vaccines to check the efficacy.

2) help in potential of conducting organ functions or transplants in injured body in future.

3) help to understand the proper

functioning of organs under different circumstances

4) potential to develop precision drugs or person specimen curative surgeries

5) ethical dimension: reduces the trials on animals, subjecting them to varied stress conditions.

Concerns → ① lack of standard practices / formulations. debate regarding potential ② to develop designer babies

④ biasness of treatment or wider gap between rich & poor in healthcare.

③ lack of known accuracy or effectiveness in long run.

Hence, need to formulate SOPs, proper regulations, raise awareness to help harness the potential of this futuristic technology in healthcare.

4. भारत के स्टार्ट-अप परिवेश की उत्कृष्ट प्रगति के बावजूद, देश में डीप टेक स्टार्ट-अप्स विकसित करने की तत्काल आवश्यकता को कम करके नहीं आंका जा सकता है। स्पष्ट कीजिए। (150 शब्दों में उत्तर दीजिए)

Despite the impressive progress of India's start-up ecosystem, the pressing need to develop deep tech start-ups in the country cannot be overstated. Elucidate. (Answer in 150 words) 10

Indian startup ecosystem is the third largest in the world with over 100 unicorn startups, helping in economic progress. research and innovation in the country.

Need to develop deep tech startups →

1) economic: help in develop new & emerging capabilities, improving process efficiency, improving data use and increasing employment.
eg robotics, drone.

2) security: can help build strategic capabilities by leveraging futuristic

technology. Eg drones, radars.

3) governance: improved governance - transparent, citizen centric, accountable, responsive → Eg use in e-governance of AI, ML technology.

4) improving social outcomes: using Nanotechnology in healthcare, data analytics in welfare schemes, AI in education sector etc.

5) environment protection: increasing sustainability, resource use efficiency and providing solutions to climate risks.

Hence, deep technology startups can help in overall development of mankind and must be promoted by proper funding, regulations, skilled work force & support early on.

5. कुछ ऐसे वैकल्पिक ऊर्जा भंडारण समाधानों की पहचान कीजिए, जिनका उपयोग अक्षय ऊर्जा ट्रांजिशन हेतु हमारी क्षमता का विस्तार करने के लिए लिथियम-आयन बैटरी के साथ या उसके स्थान पर किया जा सकता है। (150 शब्दों में उत्तर दीजिए)

Identify some alternative energy storage solutions that can be used alongside or in lieu of lithium-ion batteries to expand our capacity for renewable energy transition. (Answer in 150 words) 10

One of the major issues in renewable energy transition currently is the issues surrounding storage of renewable energy generated and their grid connection.

Alternative energy storage solutions to lithium ion battery →.

1) Hydrogen fuel cell → Pro = high energy density, hydrogen is abundantly available.

Con = unstable nature, nascent technology.

2) Sodium ion battery →.

Pro = more stable, Na is readily available.

Cons = lesser energy density, bulky battery system.

3) Nickel-Cadmium battery storage system

Pro = stable system, can be scaled easily, easy to replace.

Con = lower energy density than lithium ion.

4) Advanced Chemistry cell battery →

Pro = low flammability, can produce current in reverse charging, less expensive.

Con = lower energy density, difficult to scale in current form.

Hence, India needs to invest & research more in battery technology storage in order to make renewable energy transition sustainable. NITI AAYOG paper on battery storage is calls in point.

6. पृथ्वी पर मौजूद प्रौद्योगिकी और अवसंरचना पर भू-चुंबकीय तूफान के संभावित प्रभाव क्या हैं? (150 शब्दों में उत्तर दीजिए)

What are the potential impacts of geomagnetic storm on the technology and infrastructure on Earth? (Answer in 150 words) 10

Geomagnetic storms refers to disturbances in earth's magnetic field due to interaction of sun's solar wind or huge magnetic field waves in solar system with the earth's magnetic field.

Impact on technology and infrastructure on earth →

1) damage earth's satellites. Eg Last year, SpaceX satellites were damaged by solar storms.

2) interference in the communication technology of earth : dependent on radio waves, satellite communication etc.

3) appearance of geographical phenomenon like aurora on the earth's polar region. (eg) in Norway.

4) can cause climate risks like heat waves, wildfires in affected region.

5) potential to damage infrastructure on earth if occur in huge intensity.

6) affect earth's atmospheric processes like ozone formation.

7) flights, associated navigation technology can malfunction.

Hence, it is dangerous to both lives and assets on earth and in space.

Need to develop early warning system, build resilience of space assets, develop technology to counter huge geomagnetic storms to remain safe.

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7. जैसा कि भारत चंद्रयान-3 मिशन के लिए तैयारी कर रहा है, इसके पिछले चंद्र मिशनों से बहुत कुछ सीखा जा सकता है। चर्चा कीजिए। (150 शब्दों में उत्तर दीजिए)
As India prepares for the Chandrayaan-3 mission, there is much to be learned from its previous lunar missions. Discuss. (Answer in 150 words) 10

Chandrayaan-3 mission is India's third lunar exploration mission with an aim to soft land a rover on the moon's south pole.

Learnings from it's previous moon missions →

1) learn from the failed soft landing during Chandrayaan-2 → improves deacceleration process, velocity control during landing.

2) use orbiter data from Chandrayaan-2 to decide on landing site → which is free from craters (3) potential to run lander, rover from solar energy.
→ hence, site with available sun

rays must be chosen.

④ decide on instruments to be added based on orbiter findings of molecules like Hydrogen etc. to conduct further on site experiments.

⑤ to coordinate with previous data regarding landing date, time frame and various real time concerns.

Hence, there is much to be learned from previous lunar missions to make Chandrayaan-3 a success. It will help India join an elite club - Russia, USA, China of successful landing on moon + to be the 1st to soft land on earth's south pole side.

8. ग्रीन हाइड्रोजन में CO_2 उत्सर्जन को बहुत हद तक कम करने, जलवायु परिवर्तन का मुकाबला करने और भारत को नेट-जीरो ऊर्जा आयात की ओर ले जाने की क्षमता है। चर्चा कीजिए। (150 शब्दों में उत्तर दीजिए)

Green hydrogen has the potential to drastically reduce CO2 emissions, fight climate change, and put India on a path towards net-zero energy imports. Discuss. (Answer in 150 words) 10

Green Hydrogen refers to the process of generating Hydrogen from electrolysis of water using renewable energy. India has launched National Green Hydrogen Mission to harness it's potential.

potential of green Hydrogen →

1) reduce Co_2 emissions ∵ doesn't produce any carbon by product + intake energy is also renewable.

2) help fight climate change → ∵ no green house gas emissions → global warming is reduced.

3) abundantly available to meet India's growing energy need.

Government target → to generate energy equivalent to 125 GW by green hydrogen in renewable form annually by 2030 + abate 5 MMT of carbon annually by 2030.

Challenges → ① expensive.
② nascent technology
③ Hydrogen is unstable and highly flammable
④ need infrastructure development.

India has set an ambitious target via it's green Hydrogen mission which will help us generate requisite renewable energy and achieve net zero carbon economy by 2070.

9. आधुनिक विज्ञान में जगदीश चंद्र बोस के योगदान का विवरण दीजिए। (150 शब्दों में उत्तर दीजिए)

Give an account of the contributions of Jagadish Chandra Bose to modern science. (Answer in 150 words) 10

Jagdish Chandra Bose is a renowned Indian physicist, botanist and scientist who worked in multidisciplinary fields during the 20th century.

contributions of J.C. Bose -

1) studying and conducting experiments on plant stimuli using sunlight etc. in his laboratory.

2) studying about radiowave experiments and microwave studies

3) developed instrument = crescograph to measure plant growth.
→ this helped to demostrate

capability of various hormone, proteins, different environment conditions on plant growth.

4) worked in science fiction, especially in Bengali language.

5) worked as a professor disseminating his knowledge and observations to next generation scientists.

Hence, J.C. Bose has contributed significantly to modern scientific development in India, especially in plant physiology and growth and instilling a scientific culture in community.

10. भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) 2023 में आदित्य-एल1 को लॉन्च करने के लिए पूर्ण रूप से तैयार है। आदित्य-एल1, आदित्य-1 से कैसे अलग है? साथ ही, आदित्य-एल1 के वैज्ञानिक उद्देश्यों का उल्लेख कीजिए। (150 शब्दों में उत्तर दीजिए)

Indian Space Research Organisation (ISRO) is all set to launch Aditya-L1 in 2023. How is Aditya-L1 different from Aditya-1? Also, state the scientific objectives of Aditya-L1. (Answer in 150 words) 10

ISRO's Aditya L-1 mission is an ambitious project to study the sun and it's atmosphere from Lagrange point-1 (L1) in space.

difference between Aditya-1 & Aditya-L1 coverage of solar components:

1). Aditya 1 was to study only Sun's corona (VS) Aditya L-1 will study corona, photosphere, chromosphere etc.

2). point in space: Aditya L-1 will be launched at Lagrange point 1. (VS) Aditya-1 to be launched other pt.

3) payloads: Aditya L-1 has much more payloads than Aditya-1.

4) energy efficiency in operation:
Aditya L-1 is most energy efficient due to location of L-1.

#scientific objectives of Aditya L-1 →

1) to study the sun and it's atmosphere coronal mass ejection, impact on earth.

2) to gather information regarding evolution of the universe.

3) to demonstrate technology to study sun and launch mission to L-1.

Hence, Aditya L1 is an ambitious project by ISRO and will help reach giant stride in space study and development capability.
It will help India become a major player in space research.

11. राष्ट्रीय भू-स्थानिक नीति के तहत प्रस्तावित संस्थागत ढांचे को रेखांकित करते हुए, विश्लेषण कीजिए कि यह भारत में भू-स्थानिक अवसंरचना को कैसे सुदृढ़ करेगा। (250 शब्दों में उत्तर दीजिए)

Highlighting the institutional framework proposed under the National Geospatial Policy, analyse how it will strengthen the geospatial infrastructure in India. (Answer in 250 words) 15

National geospatial policy aims to make India a global power in geospatial data and harness it for India's national security, economic growth and achieving sustainable development goals.

Institutional framework under National geospatial policy →

1) Department of Science & technology (DST) will be the nodal agency for coordination and implementation of policy objectives.

2) setup a geospatial data promotion

and development council (ADPDC) to formulate effective data collection and usage policies + also monitor data processing.

3) enable industry-academia-government linkage + democratise data usage.

strengthen geospatial ~~data~~ infrastructure in India→

1) help build topographical and survey maps in high resolution

2) build digital elevation model (DEM) for various regions.

3) also, bathymetric data and sea surface mapping will be done.

4) digital twins of major cities &

towns will be development.

5) it will help enable greater satellite data collection and map capabilities. ⇒ remote sensing satellite

6) enable infrastructure development in private sector and research institutions → building knowledge economy

7). development of efficient computing network and computing capabilities.

Hence, National geospatial data lays out a framework and well defined vision to make India a global leader in geospatial policy and it's use. Need to address cybersecurity, data privacy and requisite infrastructure concern

12. स्पष्ट कीजिए कि भारत को जैव प्रौद्योगिकी के क्षेत्र में अवसरों की भूमि क्यों माना जाता है। साथ ही, एक अग्रणी जैव-विनिर्माण केंद्र बनने में भारत की तैयारियों पर चर्चा कीजिए। (250 शब्दों में उत्तर दीजिए)

Explain why India is considered a land of opportunities in the field of biotechnology. Also, discuss India's preparedness in becoming a leading bio-manufacturing hub. (Answer in 250 words) 15

Biotechnology refers to the use of living organisms or their processes in tackling issues. India is considered a pioneer in bio-technology sector due to huge potential and capabilities.

India as a land of opportunities in biotech →

1) Agriculture sector: can help solve Indian agriculture problems like achieving climate resilience, low input-high output products. Eg use of GM crops, producing hybrid variety.

2) Healthcare: can develop healthcare

capabilities in DNA technology, diagnostic, precision medicines etc.

3) pharma sector: help emerge as world's leading pharma.

4) economy: leverage startup, business in using biotechnology process and product development.

India's preparation → 1) setup a separate department = Department of Biotechnology to act as nodal agency → develop vision.

2) BIRAC = Biotechnology research & accreditation council → formulate policies & research

3) genetic engineering appraisal committee (GEAC) → to approve GM crops.

4) National Biotechnology policy → to develop infrastructure, promote business, research & collaboration.

5) improving startup ecosystem and private partnership.

Challenges in leveraging biotechnology potential -

1) structural deficit: funding, infrastructure development.
2) low private sector participation.
3) lack of research and innovation
4) low industry - academia partnership
5) hesitancy regarding safety. Eg GM mustard.

Hence, we must address concerns and leverage the immense potential of biotechnology to develop efficient systems, improve productivity, personalised solution to help India become a leader in biotechnology solutions.

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13. AI चैटबॉट्स के संबंध में हाल के घटनाक्रमों का विवरण प्रदान कीजिए। साथ ही, उनसे जुड़े संभावित लाभों और चिंताओं पर भी चर्चा कीजिए। (250 शब्दों में उत्तर दीजिए)

Provide an account of the recent developments regarding AI chatbots. Also, discuss the potential benefits and concerns associated with them. (Answer in 250 words) 15

AI chatbots refers to an emerging technological use of deep learning which uses natural language processing to understand, interact and generate text, music, images etc.

recent developments regarding AI chatbots →

1) ChatGPT was the first to get most popularised

2) Big technology company's have also, since then, launched their own Chatbots. Eg Google's Bard.

3) They are used to interact with customer, promote sales, design

music, write texts etc. in a wide array of work.

Potential benefits →

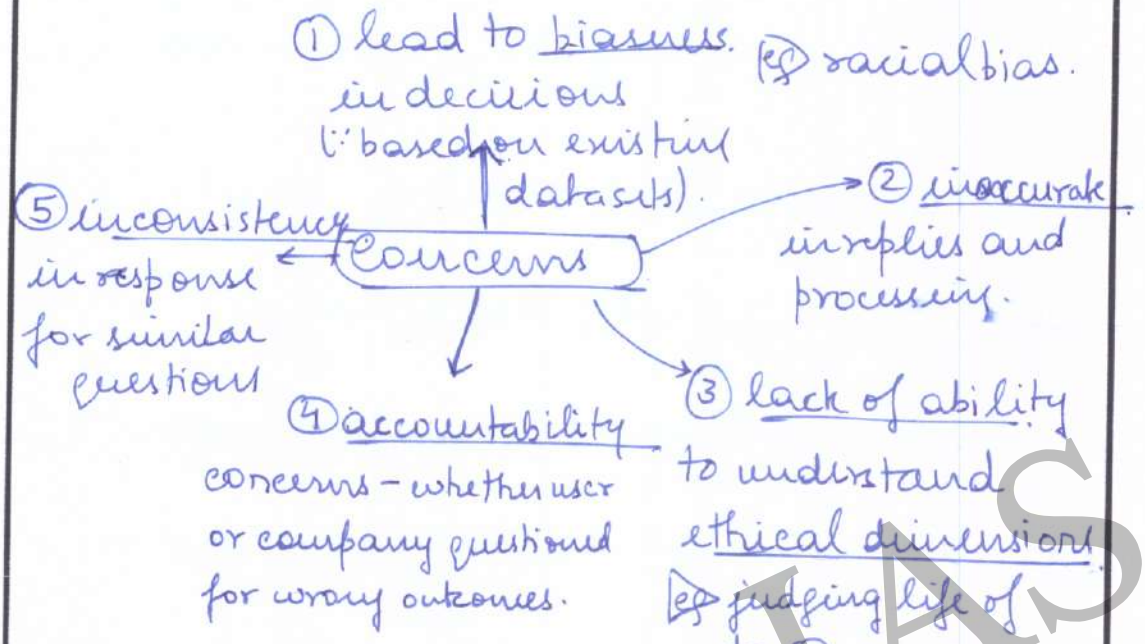
1) economic prosperity and productivity will increase → ∵ routine jobs or works can be performed by them effectively. ☞ writing webpage code

2) help improve worker skills by complementing working/learning and also create new jobs in deptech.

3) improve governance outcomes and scheme awareness. ☞ Judiciary.

4) social sector benefits are likely in education learning, healthcare, helping in case of social isolation etc.

concerns associated with them



Hence, there must be a regulatory framework for their use with proper inclusive, ethical and all stakeholder responsive guidelines ensuring diversity in datasets.

They can be useful in many economic and social spheres. International collaboration, responsible, accountable mechanisms should be put in place.

14. शिक्षा में कृत्रिम बुद्धिमत्ता (AI) के अनुप्रयोग में पारंपरिक शिक्षण विधियों में क्रांति लाने और छात्रों के लर्निंग आउटकम्स में सुधार करने की क्षमता है। चर्चा कीजिए। (250 शब्दों में उत्तर दीजिए)

The application of artificial intelligence (AI) in education has the potential to revolutionize traditional teaching methods and improve student learning outcomes. Discuss. (Answer in 250 words) 15

Artificial intelligence (AI) has been increasingly being used in various sector to revolutionize them in service delivery, efficiency, responsiveness & dynamism. One such sector where it can be used effectively is education.

Positive impacts of AI in education→

1) help in designing student specific personalised courses for improved learning outcomes. = flexible & self paced.

2) innovative ways to teach static content
Eg use of interactive maps.

3) real time monitoring → improving feedback and actionable data.

4) bringing in syllabus updation in a faster manner. ⇨ current events.

5) helping teachers perform routine tasks, prepare better modules, efficient delivery of content.

concerns associated with AI in education →

1) digital literacy is low in India.

2) digital divide → rural-urban, gender based etc. → widening increasing education inequality.

3). lack of upgraded school infrastructure and teacher training/awareness.

4) biasness in content delivery, might lead to inaccurate learning.

5) students will miss out on inter-

personal class interactions, teacher-student interactions.

→ 6) which are important to learn values of tolerance, compassion etc.

government initiatives →

1) NEP, 2020 envisages use of AI and other digital skills in learning

2) National program on AI.

3) AIRAWAT → increasing research & industry-academia linkage

Hence, AI in education can revolutionize outcomes by making it personalized, realtime, effective but concerns of divide, biasness etc. need to be address. Mix of physical and AI based modules should be way forward.

15. भले ही चौथी औद्योगिक क्रांति दुनिया में क्रांति लाने का वादा करती है, किंतु इसे अपनाने में कुछ संभावित जोखिम जुड़े हैं। इस संदर्भ में, तेजी से बदलते प्रौद्योगिकी परिदृश्य को अपनाने में भारतीय उद्यमों की सहायता हेतु ध्यान केंद्रित करने वाले प्रमुख क्षेत्रों पर चर्चा कीजिए। (250 शब्दों में उत्तर दीजिए)

Though the Fourth Industrial Revolution promises to revolutionise the world, there are potential risks associated with its adoption. In this context, discuss the key areas to focus upon to aid the Indian enterprises in adapting to the fast-changing technology landscape. (Answer in 250 words) 15

Fourth Industrial Revolution (IR) refers to the use of emerging technologies like Internet of things (IoT), AI etc. in automating the processes and value chain of productions and manufacturing systems.

promises to revolutionize the world →

1) increase efficiency and productivity of system ∵ integrating different processes usefully.

2) improving safety → ∵ real time monitoring and evaluation of all processes.

3). leveraging new age processes for greater innovation and application in products.

potential risks in adoption:-

1) increasing costs in production and increased reliance on foreign technology

2) loss of informal, unskilled, semi-skilled workforce.

3) difficult to regulate such processes, lack of clear mechanisms/guidelines.

Key areas to focus to aid Indian enterprises become 4th IR ready:-

1) comprehensive legal, regulatory framework with clarity of roles.

2) reskilling, upskilling of workers.

3) incentives for adoption of technology to reduce costs.

4) increase research & innovation to develop indigenous system → decreased reliance and improved competitiveness

5) handhold support, incubation system, joint pilot projects. → to raise awareness help in adoption etc.

Hence, 4th IR has potential to revolutionize the manufacturing processes and way company function. Need to develop capabilities, build indigenous technology and systems to help leverage the true potential while developing clear legal framework, awareness to address concerns.

16. भारत में विज्ञान, प्रौद्योगिकी और नवाचार के संबंध में, हड़प्पा सभ्यता के लोगों को वास्तविक प्रवर्तक माना जा सकता है। उपयुक्त उदाहरणों के साथ चर्चा कीजिए। (250 शब्दों में उत्तर दीजिए)
With regard to science, technology and innovation in India, the people of the Harappan civilization can be considered as the real pioneers. Discuss with appropriate examples. (Answer in 250 words) 15

Harappan civilisation, which is claimed as India's first urban civilisation has truly been a pioneer in scientific development as part of their progress in various domains.

Science, technology, innovation in Harappan civilization →

1) art of ship building ⇒ naval design and building centres in Lothal.

2) navigation and trade across seas, using boats and devices like compass. ⇒ trade with mesopotamia

3) materials: used burnt brick and mortar in construction.

4) proper urban planning and town design. Eg upper and lower citadel. Eg houses and grid pattern usage.

5) efficient drainage and sewage management system. Eg street drain with manholes, proper canal and storage structures on rivers, diversion.

6) road network was well laid out.

7) agriculture and crop production was well developed. Eg use of plough, various crops like barley grain found.

8) art of bead making, seals for trade and education as well as

jewellary making was developed.

10) use of metal casting. ☞ Cire Perdue for Bronze sculptures (Lost wax).

11) pottery was used for storing, straining ; handmade as well as wheel based.

12) script was used on seals, building ⟶ showing development of language

Hence, Harappan civilisation can be considered as true pioneer and innovation in scientific development in Indian History in various fields of daily life as well as socio-economic sphere. from trade to water supply management etc.

17. भारत में परमाणु प्रौद्योगिकी के विकास में होमी जहांगीर भाभा के योगदान का उल्लेख कीजिए। क्या आपको लगता है कि भारत को अपनी ऊर्जा सुरक्षा सुनिश्चित करने के लिए परमाणु ऊर्जा के विकास को प्राथमिकता देनी चाहिए? (250 शब्दों में उत्तर दीजिए)

Bring out the contributions of Homi Jahangir Bhabha in the development of nuclear technology in India. Do you think India should prioritise the development of nuclear energy to ensure its energy security? (Answer in 250 words) 15

Homi Jahangir Bhabha is regarded as the 'father of India's nuclear programme' helping India develop a comprehensive three stage nuclear technology development program.

contributions of Homi J. Bhabha →.

1) guiding Atomic energy establisment and tata institute of research in nuclear physics as director.

2) setup cosmic ray lab in IISC.

3) planning and formulating India's 3 stage nuclear programme

using Indigenous thorium reserves, when others focused on uranium.

4) helping research in requisite technology for India's reactor.

Eg fast breeder reactor.

Advantages of Nuclear energy →

1) cost effective in scaling and producing energy in long run.

2) cleaner mode of energy production

3) India has abundant thorium reserve in form of Monazite sand

4) can be used in remote locations and as reliable source of energy.

Challenges in nuclear energy →

1) safety risks in case of cyber attack

, nuclear disasters. Eg Chernobyl, 1986.

2) risk to health of employees and local community.

3) nuclear waste disposal is still a challenge → environmental damage

4) India has low uranium reserves

Hence, considering the above challenges, India should take a calibrated stance in its nuclear energy programme. New technology like Small Modular reactor, improving our 3rd stage of nuclear programme should be done but we must Not be overly dependent on nuclear energy for our energy security due to risks associated.

18. हालिया समय में, पुराने ताप विद्युत संयंत्रों को बदलने और भारत की ऊर्जा जरूरतों को पूरा करने के लिए स्मॉल मॉड्यूलर रिएक्टर्स (SMRs) की स्थापना की मांग बढ़ रही है। इस संदर्भ में, भारत में SMRs स्थापित करने की संभावनाओं और चुनौतियों का उल्लेख कीजिए। (250 शब्दों में उत्तर दीजिए)

Recently, there has been a growing demand for the installation of small modular reactors (SMRs) to replace ageing thermal power plants and meet India's energy needs. In this context, bring out the prospects and challenges of setting up SMRs in India. (Answer in 250 words) 15

Small modular (SMR) reactors refer to reactors which are capable of harnessing nuclear energy of upto 300 MW per unit. There are making news to help India adopt SMR and transition to clean energy usage.

Prospects of setting up SMR in India →

1) faster and easier to install
→ can be setup in factory and brought to site to install.

2) lower cost than traditional nuclear

reactors ⇒ cost effective alternative.

3) reduce GHGs significantly compared to fossil fuel ⇒ cleaner alternative to India's energy needs.

4). easier to scale up in operations.

5) can be installed in remote areas, constant supply and easy on grid storage unlike renewable sources like solar and wind.

Challenges concerning SMRs →.

1) technology still nascent and not indigenous

2) harmful nuclear radiations of reactors can harm local population and employee.

3) concerns regarding disposal of nuclear waste.

4) can be damaged by disaster etc. leading to catastrophic costs
Eg fukushima reactor, Japan.

5) need more initial cost than other renewable like solar.

6) lack of research, development in India.

Hence, SMRs appear as a potential course for future energy generation in cleaner manner but concerns regarding nuclear handling and safety risks along with technology development need to be worked out before harnessing in bigscale.

19. क्वांटम प्रौद्योगिकी आर्थिक संवृद्धि को संचालित करने और लोगों के जीवन को बेहतर बनाने में महत्वपूर्ण भूमिका निभा सकती है। चर्चा कीजिए। साथ ही, इससे जुड़ी चुनौतियों को भी सूचीबद्ध कीजिए। (250 शब्दों में उत्तर दीजिए)

Quantum technology can play a key role in driving economic growth and improving the lives of people. Discuss. Also, enumerate the associated challenges. (Answer in 250 words) 15

Quantum technology ~~wofge~~ refers to the use of principles of quantum mechanics in improving efficiency in technological operations for faster speeds, greater capacity to handle processes, more accuracy etc.

Quantum technology can play a key role in driving economic growth and improving lives →.

1) increase in resource use efficiency and productivity improvement of businesses. Eg use in Industry 4.0.

2) help improve computing operations

→ more complex data processes & challenges can be solved.

3) faster and more secured communi-cation due to Quantum key use.

4) help in improving technology development → nanotechnology, AI → improvement in healthcare, education, → improving people lives.

5) better governance capabilities → more citizen centric & data driven governance

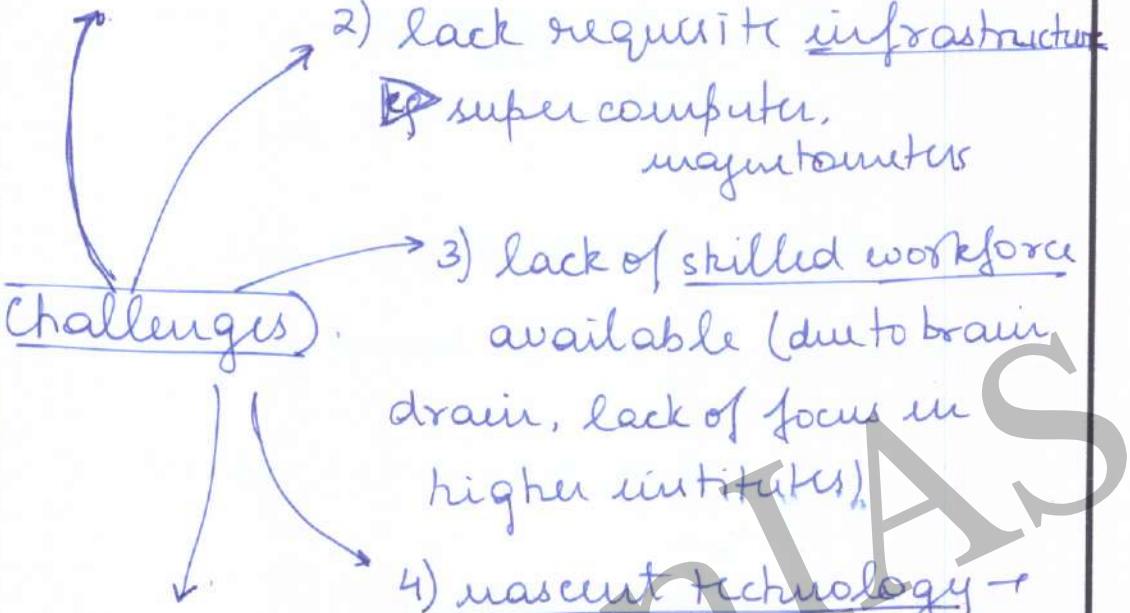
6) improved logistic management for businesses.

7) greater innovation, improved research & development → more economic prosperity and citizen friendly initiatives

Challenges associated with Quantum

technology development in India →

1) expensive: in current technology



Government has come up with a National Quantum Mission (NQM) which aims to address the above concerns and help leverage quantum tech. for economic growth, human development and national security.

20. केंद्रीय बजट 2022-23 में अंतरिक्ष अर्थव्यवस्था को भारतीय अर्थव्यवस्था के लिए एक महत्वपूर्ण 'सनराइज अपॉर्चुनिटी (उदीयमान अवसर)' के रूप में सूचीबद्ध किया गया है। चर्चा कीजिए। साथ ही, भारत को विश्व में अंतरिक्ष प्रौद्योगिकी का केंद्र बनाने के लिए किए गए उपायों को भी सूचीबद्ध कीजिए। (250 शब्दों में उत्तर दीजिए)

The Union Budget 2022-23 has listed space economy as an important 'sunrise opportunity' for the Indian economy. Discuss. Also, list the measures taken to make India the space hub of the world. (Answer in 250 words) 15

Union budget 2022-23 discribes space economy as a 'sunrise opportunity' due to use of space technology across multiple domains → economy, national security, human development and it's development will help India accelerate it's economic growth.

#. Importance of space economy →

1) will help in employment generation in emerging sector with development of a skilled & future ready workforce

2) help in bringing investment in Indian startups and businesses.

3). space research and development will help emerge as global leader in this futuristic technology.

4) lead to development of space equipments like rockets, launch vehicles, designing software etc.

5). It will also bring efficiency in other businesses via data generated from space resources.

6) help develop India's knowledge economy.

7) developing space tourism.

#. Measures taken to make India space hub of world →.

1) comprehensive National space policy cover various stakeholders & processes.

2) increased funding to ZSRO.

3) encouraging startup and private sector in space activities via Newspace India limited (NSIL)

4) improving foreign collaboration and international partnership.

Eg India-US NISAR.

5) PLI scheme includes manufacturing of space components.

6) recognising 'space' as 'sunrise sector' → various tax, research benefits given.

Hence, India's space economy is on right track with participation of private sector and comprehensive legislation. Need to implement it for helping India become major power in space sector.