

1. What are the possible benefits for a common man from the Chandrayaan Mission? Discuss.**Introduction**

Chandrayaan-2 is India's second lunar exploration mission after Chandrayaan-1, developed by the Indian Space Research Organisation. It involves the three modules: the Orbiter, Lander (Vikram) and Rover (Pragyan) to conduct various scientific experiments on the lunar surface.

Body**Benefits from Chandrayaan-2 mission to a common man:**

Chennai water crisis

- During its first mission to Moon in 2008, ISRO found the water on Moon. Experts stated that the present expedition could offer much-needed solutions to existing water shortages in Chennai.
- India is trying to identify the existence of Helium-3 on the surface of the Moon. The non-radioactive Helium-3 is touted to have the potential to power nuclear fusion reactors for centuries. Chennai, despite being a coastal city is suffering from drinking water scarcity.
- In the desalination process, the seawater is processed and made potable. However, the desalination process requires extreme energy guzzler technology. Here, Helium-3 based energy could come very handy.

Discoveries to benefit India, its citizens and humanity as a whole:

- A successful Chandrayaan 2 mission could prove to be a paradigm shift in the way expeditions to the Moon are conducted. It will also increase the understanding of space and promote global alliances, which finally culminates into "Peace".
- stimulation of technological development, and generation of scientific knowledge.

Making lives better:

- The requirements for high precision and for extreme reliability which must be imposed upon the components of a moon-travelling Chandrayaan-2 are entirely unprecedented in the history of engineering, they improve manufacturing procedures, lengthen the lifetimes of instruments, and even discover new laws of nature.
- All this newly acquired technical knowledge is also available for application to earth-bound technologies. Every year, about a thousand technical

innovations generated in the space program find their ways into our earthly technology where they lead to better kitchen appliances and farm equipment, better sewing machines and radios, better ships and aeroplanes, better weather forecasting and storm warning, better communications, better medical instruments, better utensils and tools for everyday life.

Earth's Environment:

- The Chandrayaan-2 programme is extremely exciting. Especially, the Vikram lander which will carry out several scientific experiments on the lunar surface. It will be interesting to further explore its environment, for example, its surface constituents and its connection to the Earth's environment.

Better Standard of Living:

- In our modern world, we're often looking for instant gratification. But science isn't always like that. Nuclear power wasn't harnessed for decades after the idea was first proposed; the Higgs boson was only found after over 40 years had passed and billions of dollars were invested in its search. Yet each of these achievements, along with countless others, have helped bring about the modern world, with billions of people enjoying a higher quality of life than ever before.

Motivation:

- Chandrayaan-2 will provide that inspiration to the youth and also the national public mainstream. It would inspire the young generation into notable achievements and enable them to play their legitimate role in challenging future activities.

Conclusion

The Chandrayaan-2 mission is a precursor to the ambitious Gaganyaan project, which aims to place three Indians in space by 2022.), interplanetary probes and a solar spacecraft mission (Aditya). The missions of ISRO have helped in various applications like telecommunication, military, etc. and its future missions are expected to further explore new areas in space technology.

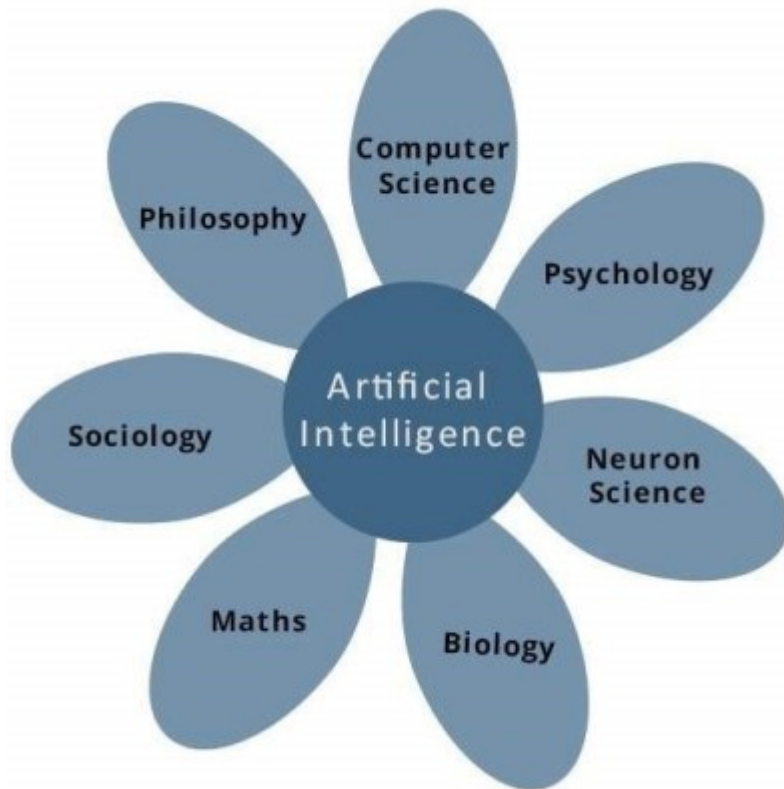
2. How is artificial intelligence making lives easier? Illustrate.**Introduction:**

Artificial intelligence (AI) makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks.

Body:

Artificial intelligence is making human lives easier and better in following ways:

Most AI examples that you hear about today – from chess-playing computers to self-driving cars – rely heavily on deep learning and natural language processing. Using these technologies, computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data.

AI applications:

- AI automates repetitive learning and discovery through data. But AI is different from hardware-driven, robotic automation. Instead of automating manual tasks, AI performs frequent, high-volume, computerized tasks reliably and without fatigue.
- AI adds intelligence to existing products. In most cases, AI will not be sold as an individual application. Rather, products you already use will be improved with AI capabilities, much like Siri was added as a feature to a new generation of Apple products.
- AI adapts through progressive learning algorithms to let the data do the programming. AI finds structure and regularities in data so that the algorithm acquires a skill: The algorithm becomes a classifier or a predictor.
- AI achieves incredible accuracy through deep neural networks – which was previously impossible. For example, your interactions with Alexa, Google Search and Google Photos are all based on deep learning – and they keep getting more accurate the more we use them.

- AI gets the most out of data. When algorithms are self-learning, the data itself can become intellectual property. The answers are in the data; you just have to apply AI to get them out.
- Health Care: AI applications can provide personalized medicine and X-ray readings. Personal health care assistants can act as life coaches, reminding you to take your pills, exercise or eat healthier.
- Manufacturing: AI can analyze factory IoT data as it streams from connected equipment to forecast expected load and demand using recurrent networks, a specific type of deep learning network used with sequence data.

Issues with Artificial Intelligence:

- There is a lot of uncertainty about the kind of AI we may one day reach that would achieve human-level intelligence or possibly more.
- In the near term AI serves as a tool that can magnify the amount of power an individual has. For example, someone could buy thousands of cheap drones, attach a gun to each of them, and develop AI software to send them around shooting people. If the software was good enough this could result in far more destruction than a normal terrorist attack.
- In the short term, there is a threat being posed to many job markets in the form of automation, and for many automation problems.
- Gap between developed and developing countries to increase-due to skill difference.

Conclusion:

The power of artificial intelligence that unintentionally causes destruction and damage cannot be ignored. What will help us control it better is research and in-depth study of the importance of artificial intelligence. Research alone can control the potentially harmful consequences of AI and help us enjoy the fruit of this innovation.

3. What are the applications of nanotechnology in the medical field?

Introduction:

Nanotechnology is science, engineering, and technology conducted at the nanoscale, which is about 1 to 100 nanometers. Physicist Richard Feynman is the father of nanotechnology.

Body:

Nanomedicine is an application of nanotechnology which works in the field of health and medicine. Nanomedicine ranges from the medical applications of nanomaterials and biological devices to nanoelectronic biosensors and even possible future applications of molecular nanotechnology such as biological machines. Some applications are discussed below.

- **Drug Delivery:** Nanoparticles are used for site-specific drug delivery. In this technique, the required drug dose is used and side-effects are lowered significantly as the active agent is deposited in the morbid region only. Targeted medicine reduces drug consumption and side-effects. This highly selective approach can reduce costs and pain to the patients.
- **Tissue Engineering:** With the help of nanotechnology, damaged tissue can be reproduced or repaired. These artificially stimulated cells might revolutionize the transplantation of organs or artificial implants.
- **Antibacterial Treatments:** Researchers are developing a technique to kill bacteria using gold nanoparticles and infrared light. This method may lead to improved cleaning of instruments in hospital settings.
- **Wound Treatment:** Researchers have demonstrated a bandage that applies electrical pulses to a wound using electricity produced by nanogenerators worn by the patient.
- **Cell Repair:** Nanorobots could be programmed to repair specific diseased cells, functioning in a similar way to antibodies in our natural healing processes.
- **Cancer Treatment:** Nanoparticles have a high surface area to volume ratio. This allows for many functional groups to be attached to a nanoparticle, which can seek out and bind to certain tumour cells. Iron nanoparticles or gold shells are finding important application in cancer treatment.
- **Imaging:** In vivo imaging is another area where tools and devices are being developed. Using nanoparticle contrast agents, images such as ultrasound and MRI have a favourable distribution and improved contrast.
- **Blood purification:** In contrast to dialysis, which works on the principle of the size-related diffusion of solutes and ultrafiltration of fluid across a semi-permeable membrane, the purification with nanoparticles allows specific targeting of substances. Additionally larger compounds which are commonly not dialyzable can be removed using Magnetic microparticles.
- **Medical Device:** Neuro-electronic interfacing is a visionary goal dealing with the construction of nanodevices that will permit computers to be joined and linked to the nervous system.
- **Gene sequencing:** has become more efficient with the invention of nanodevices like gold nanoparticles, these gold particles when tagged with short segments of DNA can be used for detection of genetic sequence in a sample.
- **Stem Cell Technology:** Nanotechnology has made an excellent contribution to the field of stem cell research. For example, magnetic nanoparticles (MNPs) have been successfully used to isolate and group stem cells.

Conclusion:

Advancement in the field of nanotechnology and its applications to the field of medicines and pharmaceuticals has revolutionized the twentieth century. A nanotechnology is a valuable tool for the prevention, diagnosis and treatment of human diseases. The medical area of nanoscience application has many projected benefits and is potentially valuable for all human races.

4. How can robotics be a game changer for agriculture? Discuss.

Introduction:

Agriculture is quickly becoming an exciting high-tech industry, advancing the production capabilities of farmers. The robotics technology coupled with digital mechanization possesses potential in bringing positive transformation across agricultural landscape globally and especially in India in the backdrop of challenges like lack of favourable terms of trade, vagaries of monsoon, sluggish technology adaptation, productivity per yield etc.

Body:

How can robotics be a game changer?

- **Precision Agriculture:** Weed control using robotics and machine learning, to pinpoint the application of fertilizers and herbicide. Field tests have reported using only 10 percent of the herbicide needed in the past. The concept can be reversed to precisely apply fertilizer to only desired plants, thereby reducing waste while optimizing yields.
- **Solution to lack of labour:** Robotics for agricultural activities like fruit picking, harvesting etc. For example: Large scale Orange harvesting with agricultural robots in France and USA. Example: Virgo, the robotic harvesting system.(Source-Google)



- **Full field capacity work:** The robots do not get sick or tired and they do not need the time off, they offer fewer errors at higher speeds, and the higher quality products can be sensed by the machines accurately.
- **Safety of farmers and consumers:** The robots can protect the human workers from the harmful effects of handling the chemicals by hand and through the system of high spraying, and they can reduce up to 80% of a farm's use of pesticides, avoiding contamination.
- **High productivity:** Robotics mechanism closely mimics the human method of farming, but at a much higher productivity level. Increase in farmers' income per yield and reduction in all round costs are observed.
- **Enables alternate employment and additional source of income:** Due to robotic farming, lot of time is saved for the farmers, and they can engage in alternate occupations, thus earning additional income.
- **Other applications:** Nursery planting, crop analysis, animal husbandry, dairy farming, drone service, harsh terrain resilient farming etc.

Need for robotics in Indian agriculture:

- **Growth:** According to NITI Aayog's report, Agriculture and allied sector is critical to India's growth story and to achieve and maintain an annual growth rate of 8 –10% for the Indian economy, agriculture sector must grow 4% or higher rate. Adopting technological strategies seems to be the way forward.
- **Enhance productivity:** The sector suffers from poor resource utilisation, with the production quantum and productivity still being quite low. For example, yield of cereals, comprising a major share of food grain production, in terms of magnitude is significantly lower than that of China and the USA. Technology adoption and efficient resource usage like robotics, AI, Digital mapping etc in these two countries are far higher, thus resulting in higher yields.
- **Economic strengthening:** According to CB Insights, agricultural tech start-ups in India have raised over USD800million in the last 5 years to bring AI and robotics to agriculture and are helping solve pressing issues across the agriculture value chain which is valued to be at USD2.6 billion by 2025.
- **Reduced costs:** Agri-bots being used in several regions in India which tend to crops, harvesting, weeding etc can reduce fertilizer cost up to 90% and eliminate human labour.
- **Attracting youth:** Robotics in agriculture can succeed in bringing and retaining the youth population of our country.

Challenges:

- The capital-intensive nature of Robotics.
- High cost of procuring imported hardware components as well as training personnel.
- Unavailability of skilled labour and sluggish adaptation of technology: Most of Indian agriculture is carried out in the rural dominated regions which entail difficulty in convincing the farmers to trust the technology over traditional farming.
- Repair and maintenance becomes an issue, especially in India, where reach of AI knowledge has not penetrated across the country.
- Loss of various traditional, yet effectively resilient methods suitable for Indian agriculture.
- Substitution of technology may put farmers out of their jobs and render difficulties to the already suffering state of unemployment.

Examples of Robotics in Indian Agriculture: (These are for your information)

- PAAMA Agrico under Made-in-India Agri-Equipments has designed the world-class soil tilling blades used in rotovators and cultivators. It enables a Robot to weld blades enabling the precision function - ensuring uniformity in production while facilitating repeatability function each time.
- GRoboMac: The working of this robot has been designed in such a way that the computerized vision detects and locates the precise 3D coordinates of the bloomed cotton from the images of the cotton plant. A robotic arm uses these coordinates to pick the cotton and the arm, then uses a vacuum for precision picking of cotton and avoids picking any other contaminant.

Conclusion:

Technological advancements in agriculture are an important element to fodder growth and engaging in robotics is an indispensable technique of driving this. NITI Aayog's Statement of Intent (SoI) to develop and deploy AI to provide real-time advisory to farmers in Aspirational districts is laudable at this juncture and should be extended across the length and breadth of the country.

5. What is geo-tagging? What are its applications? Discuss.

Introduction

Geotagging- It is the process of adding geographical identification like latitude and longitude to various media such as a photo or video. Geotagging can help users find a wide variety of location-specific information from a device. It provides users the location of the content of a given picture.

Note: **Geomapping** a visual representation of the geographical location of geotagged assets layered on top of map or satellite imagery

Body

Applications of geo-tagging:

- **Social media:** Users can geotag photos that can be added to the page of the location they are tagging. Users may also use a feature that allows them to find nearby Face book friends, by generating a list of people according to the location tracker in their mobile devices.
- **Daily updates:** The increasing numbers of cell phones with built-in GPS facilities are capable of geo-tagging a photograph as its being shot.
- **Efficiency:** Allows projects in remote and conflict-affected locations to be easily and accurately located, managed and validated.
- **Health system:** Used as a Monitoring Tool in Large Scale Public Health Projects it enable to capture the location on the mobile device it also allows users to read this location for varied purposes.
- **Infrastructure:** Geo-tagging of assets will ensure better monitoring, recording, and terrain mapping for future development works.
- **Public works:** Easy identification of assets created under MNREGA, such information can be utilized for creation of additional developmental works on existing assets.
- **Specific advertisements:** advertisements relevant to particular area can be customized according to targeted audience, place and product

Disadvantages of geo-tagging:

- **Information can be sold to advertisers:** Location services and geo-tagging provide information that may be sold on to advertisers, who can use this data to provide you with targeted advertising based on your position – and loads of it.
- **Private details:** Unintentionally revealing the location of yourself or your loved ones to those who have legitimate reason to assume that you or they are somewhere else. Showing up on Face book drinking cocktails in the Bahamas when you're supposed to be at work is at the milder end of this spectrum.
- **More threats:** Giving enough information about your current whereabouts to allow malicious parties to target you or your loved ones for assault, or worse.
- **Easy targets:** Providing geo-tagging metadata that could allow outsiders' access to your children or vulnerable members of your family or social circle.

Conclusion

Government agencies such as Forestry, Archaeology and Tourism in the centre as well as states are also making good use of this technology. With increased intervention, the application geo-tagging is changing the development landscape in India by bringing in more transparency and accountability

