

**1. Examine the applications of nanotechnology in biomedicine?****Approach:**

Question is straight forward in its approach students are expected to write about nanotechnology and its applications in biomedicine.

**Introduction:**

Nanotechnology is a field of research and innovation concerned with building 'things' - generally, materials and devices - on the scale of atoms and molecules. A nanometre is one-billionth of a metre: ten times the diameter of a hydrogen atom. The diameter of a human hair is, on average, 80,000 nanometres. At such scales, the ordinary rules of physics and chemistry no longer apply. For instance, materials' characteristics, such as their colour, strength, conductivity and reactivity, can differ substantially between the nanoscale and the macro. Carbon 'nanotubes' are 100 times stronger than steel but six times lighter. Nanotechnology is hailed as having the potential to increase the efficiency of energy consumption, help clean the environment, and solve major health problems. It is said to be able to massively increase manufacturing production at significantly reduced costs

**Body:****Applications of nanotechnology in biomedicine-**

- Nanomaterials have been used in diagnosis mostly as contrast agent in molecular imaging. They are usually in small size and of much higher surface area to volume ratio, thus their surface can be decorated with more therapeutic molecules, imaging agents, targeting ligands, and nucleic acids. When used as contrast agents, they can circulate in the blood for longer time with higher sensitivity and possibly fewer side-effects.
- Magnetic resonance imaging (MRI) provides superior contrast in soft tissue imaging and has no radiation. Compared with gadolinium-based MRI contrast agents, nanoparticle MRI contrast agents circulate longer in the blood, and have higher sensitivity and fewer side-effects.
- Nanomaterials have been introduced to the therapy of multiple diseases, including drug delivery system and nanodrugs. Drug delivery is one of the typical applications of
- nanomaterials in medicine. For example, tumor targeting, imaging and drug delivery can be accomplished by administrated gold nanoparticles and nanorods, iron oxide nanoworms and drug loaded liposomes. Some other nanomaterials can be used to decorate gold nanoparticles to improve the capability. The nanotechnology has also been applied to the intelligent drug-delivery systems and implantable drug-delivery systems, so as to realize the controlled and targeted release of therapeutic drugs. Besides drug delivery, nanomaterials have been adopted in some specific tumor therapies.

- The application of nanotechnology has opened a new realm in the advance of regenerative medicine. The development of nanotechnology offers more opportunities of applying stem cells in the regeneration of tissues and organs.
- The physical and chemical properties of carbon nanotubes (CNTs) have motivated their application in several areas of science. Modification of the surface of these particles and their functionalization with biological molecules at the molecular level has increased their use in nanobiotechnology. These modified particles provide well-dispersed samples that are compatible with physiological condition. In this context, nanotubes might be useful drug delivery vehicles because their nanometer size enables them to move easily inside the body.
- Nanotechnology has also found applications in tissue and implant engineering. The possibility to enhance the surface area of the material and to tune the roughness of its surface at the nanometric scale should yield better biological responses of osteogenic cells and effective mechanical contact between tissue and implant.
- The addition of bioactive minerals inspired by the bone structure has been one of the most commonly used strategies to modify metallic surfaces of the implant. Biomimetics is a desirable strategy because it predefines nanochemical and/or nanophysical structures.

However the Biosafety is mostly concerned in nanotechnological applications. It is important to better understanding the metabolic fate and biological effect in cells or organs as increasing nanomaterials are hopeful materials to be applied in medicine. The toxicity of most nanomaterials applied in biomedicine has been examined in preclinical research in that the low toxicity and optimal biocompatibility are necessary for their clinical applications.

**Conclusion:**

Products of nanotechnology will be smaller, cheaper, lighter yet more functional and require less energy and fewer raw materials to manufacture, claim nanotech advocates. Establishing the real effect of nanomaterials in biological systems is a challenging task. Nonetheless, in order to take advantage of the potential application of nanomaterials to medicine, a detailed understanding of their potential toxicity is necessary. However, the relationship between toxicity and physicochemical properties should always be interpreted cautiously to minimize false results.

**2. What are the recent initiatives announced by the government for promoting indigenous farming techniques? Discuss.****Approach**

A straightforward question where in the candidate needs to discuss the recent initiatives announced by the government for promoting indigenous farming techniques.

**Introduction**

As per UN, by 2050, the world will have 10 billion people, with India accounting for 1.73 billion. Reclaiming agriculture's spiritual roots through indigenous farming and locally grown food emerges as key, including the need for designing and implementing a more sovereign food system. The COVID-19 pandemic has made revisiting these aspects all the more necessary.

**Body**

Indigenous farming is in a nascent stage in India. About 2.78 million hectare of farmland was under organic cultivation as of March 2020, according to the Union Ministry of Agriculture and Farmers' Welfare. In this light, the recent initiatives by the government for promoting indigenous farming techniques include –

- National Mission For Sustainable Agriculture (NMSA): National Mission for Sustainable Agriculture (NMSA) has been formulated for enhancing agricultural productivity especially in rain fed areas focusing on integrated farming, water use efficiency, soil health management and synergizing resource conservation with the help of indigenous methodology.
- Paramparagat Krishi Vikas Yojana (PKVY): Paramparagat Krishi Vikas Yojana, launched in 2015 is an elaborated component of Soil Health Management (SHM) of major project National Mission of Sustainable Agriculture (NMSA). Under PKVY, Organic farming is promoted through adoption of organic villages by cluster approach and Participatory Guarantee System (PGS) certification.
- As per 17th Lok sabha standing committee on agriculture report dated March, 2020, the Ministry of Agriculture and Farmers Welfare (MoAFW) proposed 'Bhartiya Prakritik Krishi Padhati' (BPKP) as a new sub-mission under Paramparagat Krishi Vikas Yojna (PKVY).
- Mission Organic Value Chain Development for North East Region (MOVCD): It is a Central Sector Scheme, a sub-mission under National Mission for Sustainable Agriculture (NMSA) It was launched by the Ministry of Agriculture and Farmers Welfare in 2015 and aims to develop certified organic production in a value chain mode to link growers with consumers and to support the development of the entire value chain.

- Zero Budget Natural Farming: Zero budget natural farming is a method of chemical-free agriculture drawing from traditional Indian practices.
- Participatory Guarantee System (PGS): PGS is a process of certifying organic products, which ensures that their production takes place in accordance with laid-down quality standards. PGS Green is given to chemical free produce under transition to 'organic' which takes 3 years. It is mainly for domestic purpose.
- National Program for Organic Production (NPOP): NPOP grants organic farming certification through a process of third party certification for export purposes. Soil Health Card Scheme has led to a decline of 8-10% in the use of chemical fertilizers and also raised productivity by 5-6%.
- One District - One Product (ODOP): The programme aims to encourage more visibility and sale of indigenous and specialized products/crafts of Uttar Pradesh, generating employment at the district level. The presence of aggregators is imperative to bring about economies of scale for the small and marginal farmers.
- In addition to farming, the government is also emphasizing on livestock, fisheries and development of water bodies. The Rashtriya Gokul Mission, based on the conservation and development of indigenous bovine species, is an integral part of the overall development of agriculture sector. This will benefit a lot of small and marginal farmers including landless agriculture labourers who possess these indigenous species of bovines.

#### **Way Forward –**

- The industry and the government are already supporting the shift to sustainable agriculture by popularising the use of science-based good agronomic practices (GAP) that are climate-smart and financially viable.
- Enhanced collaboration will be a critical imperative to transform Indian agriculture. The government could identify specific areas along the agro value chain where public-private partnership (PPP) will benefit farmers. This will encourage the private sector to come forward with higher investments for innovation.

#### **Conclusion**

As we move into a new decade, with the right thought leadership and government support and emphasis on the indigenous farming techniques, the agriculture sector can rewrite India's growth story and place our country in the league of the top five global agricultural markets.

**3. How does India's IPR regime balance domestic interests with global trade concerns at forums like the WTO? Examine.****Approach**

Candidates are expected to write about India's IPR regime and then examine how India balance its domestic interest with global trade concerns such as on global forum like WTO.

**Introduction**

Intellectual property rights (IPR) are the rights given to persons over the creations of their minds: inventions, literary and artistic works, and symbols, names and images used in commerce. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

**Body**

India's IPR regime:

- The National Intellectual Property Rights (IPR) Policy 2016 as a vision document to guide future development of IPRs in the country. It sets in place an institutional mechanism for implementation, monitoring and review. It aims to incorporate and adapt global best practices to the Indian scenario.
- CIPAM, setup under the aegis of DIPP, is to be the single point of reference for implementation of the objectives of the National IPR Policy.

Balancing domestic interest with global trade:

- Rameshwari Photocopy case: International publishers against a photocopy shop on Delhi University's (DU) campus in order to determine whether or not copyrighted material was being used in the course of instruction. Delhi HC upheld the shop's right to photocopy course material for students.
- This is a landmark verdict as photocopies provides for huge part of students course demands in India due to its easy availability and affordability. But Discourages international publishers in Indian market.
- India's first ever compulsory license was granted by the Patent Office on March 9, 2012, to Natco Pharma for the generic production of Bayer Corporation's Nexavar, a life saving medicine used for treating Liver and Kidney Cancer. Bayers sold this drug at exorbitant rates, with one month's worth of dosage costing around Rs 2.8 Lakh. Natco Pharma offered to sell it around for Rs 9000, making it affordable for people belonging to every stratum.
- Moreover TRIPS and Doha Declaration considered compulsory license as an important provision so as to provide health benefits to the people without any discrimination on the basis of color, caste, creed or even country. CL is permitted under the WTO's TRIPS (IPR) Agreement provided conditions such as 'national emergencies, other circumstances of extreme urgency and anti-competitive practices' are fulfilled.

- Recognizing the bias in international law, the Indian Protection of Plant Varieties and Farmers' Rights (PPV&FR) entitles not just the breeder but also the farmer.
- IPR policy is driven by the agenda of IP maximalism, where IP owners' rights will be maximised at the cost of public interest. This (policy) will influence courts and judges who might consider rights of patentees above that on common man in certain cases.
- Not understanding the modes of creativity and sharing in "shadow economy", the policy leans towards superimposition of formal IP framework.
- The National IPR Policy insistently makes the case for defensive measures, or measures which are primarily targeted at preventing IPR claims on traditional knowledge being granted to unauthorised entities.
- In its latest Special 301 report released by the United States Trade Representative (USTR), the US termed India as "one of the world's most challenging major economies" with respect to protection and enforcement of IP.
- Foreign investors and MNCs allege that Indian law does not protect against unfair commercial use of test data or other data submitted to the government during the application for market approval of pharmaceutical or agro-chemical products.
- While the National IPR Policy makes the right noises when it refers to the need to engage constructively in the negotiation of international treaties and agreements in consultation with stakeholders such a pronouncement has to be backed by concerted action to defend the interests of the country and its people in a proactive fashion.
- Experts says Indian IPR regime is innovation in itself and it is prototyped by many other developing countries. The recent issues and controversies shows India needs continuous revision and fine tuning of policies to have right balance between interests of common people and investors/technologists.

### **Conclusion**

India has made a number of changes in its IPR regime to increase efficiency and has cut down the time required to issue patents. The culture of innovation is taking centre stage in the country. An efficient and equitable intellectual property system can help all countries to realize intellectual property's potential as a catalyst for economic development and social & cultural well-being.

#### **4. What are India's strategic interests in having a friendly and peaceful Bangladesh?**

**Approach-** Question is straight forward. Candidate can outline strategic importance of Bangladesh in the context of recent bilateral developments and give future roadmap of engagements to bolster the relationship.

##### **Introduction**

There is no country integrated more closely with India than Bangladesh in respect of language, ethnicity and culture. Its location is surrounded by India save for its coastline and a small border of 193 kilometre with Myanmar. The only religious difference drives the relationship to unusual degree.

##### **Body**

Recently Indian prime minister visited Bangladesh. The visits have been timed with celebrations to mark 50 years of the 1971 liberation war that led to the birth of Bangladesh. The prestigious Gandhi peace prize was awarded to sheikh Mujibur Rehman on his birth anniversary.

India's strategic interests with Bangladesh

- Strategic partnership is defined as anything relating to long term interests and goals; a strategic partnership, by extension, would relate to long term shared interests and ways of achieving them.
- Strategic partnerships are commonly associated with defence or security related issues, a wide range in bilateral relations, from defence to education, health and agriculture, and quite commonly, economic relations, including trade, investment and banking.
- Bangladesh is expected to cross India in terms per capita income. This speaks volumes about the achievements of Bangladesh when contrasted with Pakistan. At the same time, it has several implications for the region.
- Rapid and sustained economic growth in Bangladesh has begun to alter the world's perception of the subcontinent. India and Pakistan dominated the region and other countries were considered small. The economic rise of Bangladesh is changing some of that.
- Bangladesh's economic growth can accelerate regional integration in the eastern subcontinent. Instead of merely praying for the revival of Saarc, Delhi could usefully focus on the BBIN.
- Bilateral trade between India and Bangladesh stood at US\$6.6 billion in 2013–14 with India's exports at US\$6.1 billion and imports from Bangladesh at US\$462 million. The trade is set to go at \$10 billion by 2018 through ports only.
- The economic success of Bangladesh is drawing attention from a range of countries in East Asia, including China, Japan, South Korea, and Singapore.

The US, which traditionally focused on India and Pakistan, has woken up to the possibilities in Bangladesh.

#### North east and Bangladesh

- Bangladesh's economy is now one-and-a-half times as large as that of West Bengal; better integration between the two would provide a huge boost for eastern India.
- Also, connectivity between India's landlocked Northeast and Bangladesh would provide a boost to the development of north-eastern states. Delhi and Dhaka are eager to promote greater cooperation, but there has been little political enthusiasm in Kolkata.

#### Blue economy

- Both countries are looking at strengthening economic cooperation through joint investments and cooperation under the 'Blue Economy' programme.
- The programme entails synergized efforts of littoral states in the exploration of hydrocarbons, marine resources, deep-sea fishing, preservation of marine ecology and disaster management.
- The industry in India needs to look for opportunities for collaboration in defence, such as in military hardware, space technology, technical assistance, exchange of experience, and development of sea infrastructure.

#### Challenges ahead

- Despite the friendship remaining solid, the border has been sensitive. At least 25 Bangladeshis were killed in the first six months of this year along the border by Indian forces, according to a rights watchdog.
- The Teesta water dispute between West Bengal and Bangladesh remains unresolved.
- The Citizenship (Amendment) Act and the proposed National Register of Citizens, which Ms Hasina called "unnecessary", have created a negative impression about India.
- China is making deep inroads into Bangladesh by ramping up infrastructure investments and expanding economic cooperation. Bangladesh is overwhelmingly dependent on China for military hardware.
- Since 2010, India approved three Lines of Credit to Bangladesh of \$7.362 billion to finance development projects. But, just \$442 million have been disbursed until December 2018.

#### **Conclusion**

It is imperative for India to bolster ties with this all-weather friend, and there may not be a better time to do so than when Bangladesh is to celebrate the golden jubilee of its independence. Initiatives like maitri setu reaffirms strategic importance of Bangladesh. New Delhi should take a broader view of the changing scenario and growing competition in South Asia, and reach out to Dhaka with an open mind.



### 5. Analyze the key issues in India's present defense procurement regime?

#### Approach

Since the question has asked you to analyze, it means to examine (something) methodically and in detail, typically in order to explain and interpret it.

#### Introduction

Despite the increasing threats from both China and Pakistan and emerging security challenges, India's spending on defense has dropped by four per cent in terms of the government's total expenditure over the last six years.

#### Body

##### Key issues in India's present defense procurement regime:

- Public interest has not been defined or elaborated upon, and this could provide the government with far-reaching termination rights.
- The multiplicity of options with no clarity as to which recourse is linked to a specific default, could result in tremendous uncertainty for the vendor.
- No restrictions have been specified on the exploitation of the IP acquired or as to the type of contracts this right applies to (for instance, only jointly-developed IP or only "Make" contracts).
- It will be interesting to see how these agencies coordinate with each other and with the vendor to ensure a seamless transition.
- Both equity and non-equity investment is contemplated. However, the parameters of calculating offset credit for the non-equity route is currently unclear.
- While our soldiers are one of the finest in the world, it is the lack of resources that has been their bane ever since the Chinese war that exposed them to their vulnerability against an army vastly superior in armament and logistics.

#### Conclusion

Napoleon Bonaparte, military leader and former Emperor of France, said, "The army marches on its stomach." It was metaphoric. Troops can win wars if they are well stocked with not just food but guns, ammunition, clothing and more. Modi's vision 'to make in India', especially defense equipment is laudable but we need urgently a well thought out and a clear defense procurement policy keeping in mind the strategic vision and interests of India and that is well informed and dictated by the needs of the three services, in the next three to six months, that can be reviewed once in three years.

