

## SCIENCE & TECHNOLOGY AND ENVIRONMENT

Time Allowed: 3 hrs.

Max. Marks: 250

Q.	Marks	Instructions to Candidate
1.		<ul style="list-style-type: none"> <li>• There are <b>20 questions</b>.</li> <li>• All questions are compulsory.</li> <li>• The number of marks carried by a question is indicated against it.</li> <li>• Answers to questions no. 1 to 10 should be in 150 words, whereas answers to questions no. 11 to 20 should be in 250 words.</li> <li>• Keep the word limit indicated in the questions in mind.</li> <li>• Answers must be written within the space provided.</li> <li>• Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.</li> </ul>
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

Total = 76

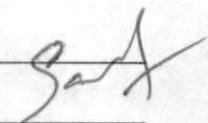
Name BHARANI V

Roll No. \_\_\_\_\_

Mobile No. \_\_\_\_\_

Date \_\_\_\_\_

Signature \_\_\_\_\_

1. Invigilator Signature \_\_\_\_\_ 

2. Invigilator Signature \_\_\_\_\_

Section - A

Q1. "Bay Of Bengal Large Marine Ecosystem Project (BOBLME) has tried to mitigate trans-boundary issues affecting marine ecosystem effectively." Critically Analyse. (10 Marks)

→ The BOBLME was launched by the littoral states of Bay of Bengal, to address the threats being faced by the BoB ecosystem.

Did not  
its objectives,  
member  
countries

Issues affecting marine ecosystem

- Pollution from land sources creating dead zones & eutrophication
- Cross boundary transport of hazardous chemicals & their dumping in the sea.
- Coral bleaching
- Plastic pollution & microbeads leading to death of marine species
- Climate change induced migration of species like fishes.

Briefly  
and discuss  
major  
initiatives  
under  
BOBLME  
Project  
↓  
Protects  
coastal  
community  
from any

Remarks

type of marine pollution,  
checks over exploitation  
of fisheries by effective  
management of marine  
resources.

→ How it tackles

- Effective coordination
- Fixing source responsibility
- Ending deep sea traveling
- Commitment to reduce plastic pollution

Make your points self explanatory

→ However, issues exist

- Lack of parties not abiding by contract
- Lack of consensus on way forward

Explain your points

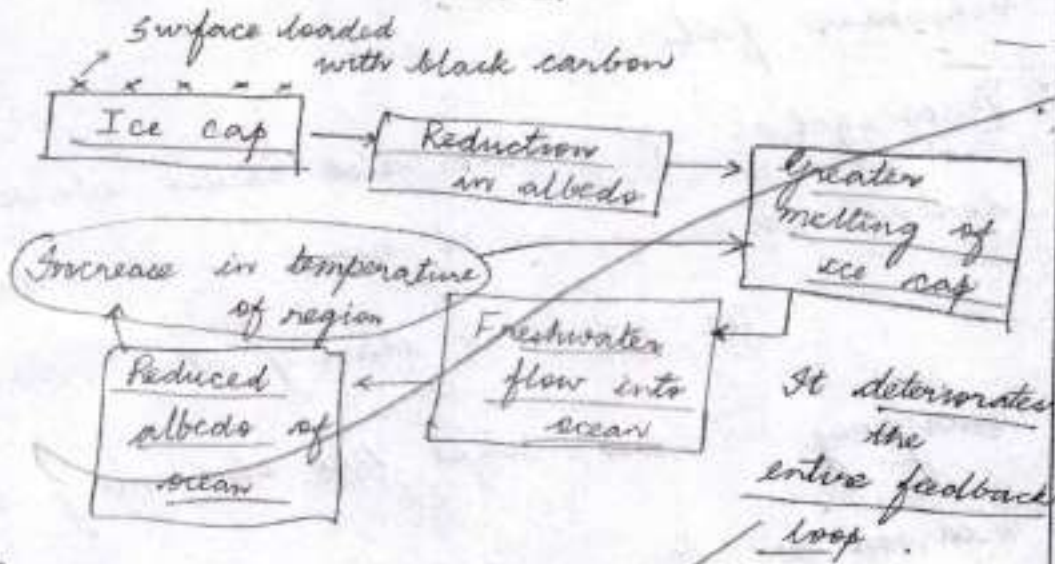
2 1/2

Q2. "Apart from affecting polar ice caps, Black Carbon has significantly contributed in receding Himalayas." Analyse. (10 Marks)

→ Explain black carbon

Black carbon is a short lived climatic pollutant that causes tremendous problems like air pollution and health hazards.

→ Impact on polar ice caps



• Besides, polar organisms like polar bear and penguins too die as a result

→ Impact in receding Himalayas

• As indicated above, the decrease in albedo leads to greater melting. As a result,

Did kill the region from where these carbon are emanating.

Repeated point

Remarks

more than 30% of the Hindukush Himalayan glaciers have melted in recent times.

→ Controlling production of black carbon

Measures should be both

Structural &

Non-Structural

Reduced burning of wood, fossil fuels and vehicular fuels

Vulcanization of rubber also causes black carbon production → it needs to be curtailed

The world is staring at a climate emergency. Unless steps like eliminating black carbon are taken; it will continue;

Diversify your portfolio  
↓  
Act as a barrier for cold Siberian wind  
- Impact rainfall pattern of Sub-continent

2 1/2

Q3. India has banned bottom trawling in few areas while Sri Lanka has banned it completely. Critically analyse the impact of bottom trawling and deep sea mining on aquatic ecosystem. (10 Marks)

→ Bottom trawling refers to the act of using trawlers and nets dragged along the bottom surface of the ocean to catch fish. It is a ~~biological~~ hazardous practice.

Explain deep sea mining too

→ Impact of bottom trawling on aquatic ecosystem

Dis Guss & Shikanta's stand on id

• Young fish get trapped and die; besides other organisms die to their tenderness

• Production of plastic and microbeads leads to death of a large number of organisms

• Alteration of sea/river course due to change in the sea bed structure

• Collection of fishing nets in areas like gyres leading to garbage patch like great pacific garbage patch

delete these points with bottom trawling practices

Remarks

• Bleaching and decoloration of corals →

Explain your point.

→ Explain these points relating deep sea mining

→ Impact of deep sea mining on marine ecosystem

• Death of chemotrophs that survive on ocean floor

• Creation of underwater earthquakes and other disasters leading to changed migration patterns

• Pollution of the marine environment due to chemicals and sand

It is imperative that bottom trawling is replaced by deep sea fishing while deep sea mining is done with utmost ecological concerns in mind.

Disruptive corrective measures to be taken to protect marine ecosystem

↓  
Innovative technology for deep sea mining, Sustainable marine policy.

3

Q4. "Anthropogenic activities have been constantly threatening biodiversity of India's hotspots". Analyze the impact of human interference on flora and fauna of these biodiversity rich regions. Suggest some of the conservation strategy with existing framework citing Gadgil and Kasturirangan reports on Western Ghat. (10 Marks)

Biodiversity hotspots are regions where the biodiversity is extremely rich Ex: Western Ghats and North East India.

Discuss the different biodiversity hotspots  
- E Himalay as  
- W Ghats  
- Indo-burma  
- Sundaland

Impact of human interference

On flora:

- Proposals like the INO observatory would lead to destruction of Shola forests
- Industrial pollution lead to death of large number of trees in Deepor beel
- Loss of halophytic properties of mangroves in Sundarbans due to enormous salinity

On Fauna:

- Disappearance of rhinos like Java rhino due to increased population pressures

Discuss hotspots specific threats  
↓  
Forest fragmentation in Indo-burma hotspot

Remarks



• Main animal conflict leading to death of elephants and tigers

• Construction of roads, telephone towers etc. leading to radiation; killing birds & insects like Bustard

### Conservation strategy

• Having a core and buffer region as is done in national parks

• Gadgil committee report on declaring 64% of Western ghats as protected area with no construction of power plants etc.

• Kasturirangan committee report recommending proper governance and strengthening local communities and forest bureaucracy.

→ Highlight the key points of Committee's report  
- Demarcation of ESZ  
- Shutting all TPP & HPP.

3

Q5. National policy on Biofuels primarily tries to address supply-side issues that has discouraged the production of biofuels within the country. In this regard, highlight the salient features of the policy and also mention the benefits of the policy.

(10 Marks)

→ Biofuels are those that are extracted from biological resources like plants and animals.

Ex: Biodiesel and Bioethanol / Did add its types

→ Supply side issues

- Insufficient area under crops like Jatropha
- Lack of buyers and processing facilities
- Correct price was not being offered, thereby, creating a lack of incentive. / make it say explanatory
- Lack of proper technology to convert crop residue to biofuel

Bring it

→ National Policy on biofuels features

- Gives impetus to 2<sup>nd</sup> and 3<sup>rd</sup> generation biofuels including those from algae to reduce carbon footprint

Remarks

- Expands the ambit of the crops to include sugarcane and barley
- Assures the right price and technology development
- Encourages startups in this field

Make these points self evident

→ **Benefits**

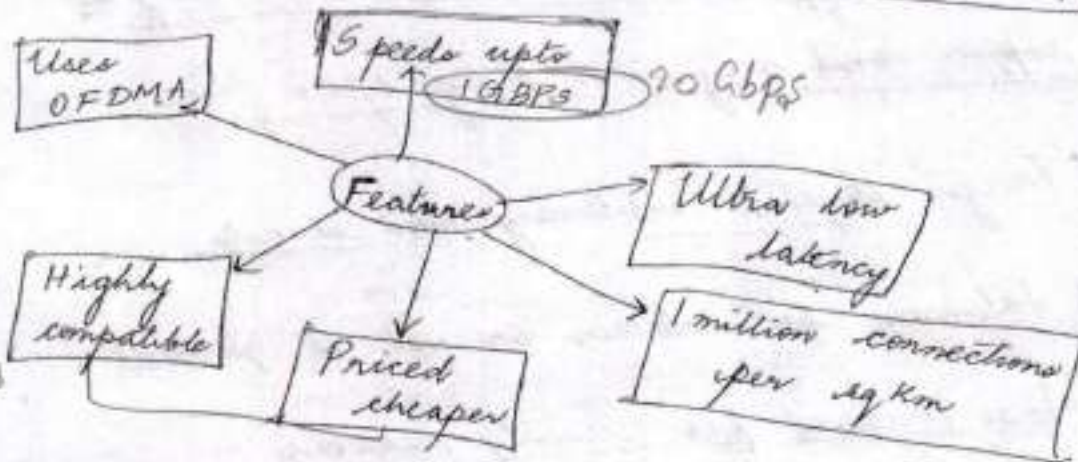
- Reduction in oil exports keeping in line with the commitment to reduce imports by 10% by 2022.
- Creation of employment besides being an additional source of farm income.
- Helps in achieving INDC under Paris accord as biofuels are net zero emitters.

Did not discuss key benefits like  
- Reducing import dependency  
- MSW management  
etc

Did not discuss key features of the policy  
- Supply chain mechanism  
- Viability  
- Cap funding  
etc

Q6. What do you understand by 5G technology? What are the advantages/applications and challenges to adapt to 5G in India? (10 Marks)

→ 5G or 5<sup>th</sup> generation is a mobile technology that is an advancement over the 4G VoLTE.



Explain these points

→ Applications for India

- Gives impetus to programs like Digital India
- Helps education based on technology like Operation digital board
- Health applications like Echo stims etc.
- As needed to push for IR 4.0 including IoT, Artificial Intelligence etc.

Discuss some advantages  
↓  
High resolution & bidirectional

Large bandwidth etc

Remarks

## Challenges for India

- Lack of a 5G Architecture and uniform standards
- Lack of sufficient backhaul with 80% being copper and only 20% being optic fibre.
- Large digital illiteracy and divide.
- Dilemma on whether or not to permit

Explain your point.

Make it self explanatory

Has Huawei for security reasons.

The government has appointed a steering committee to look into implementation of 5G. This would give the future direction

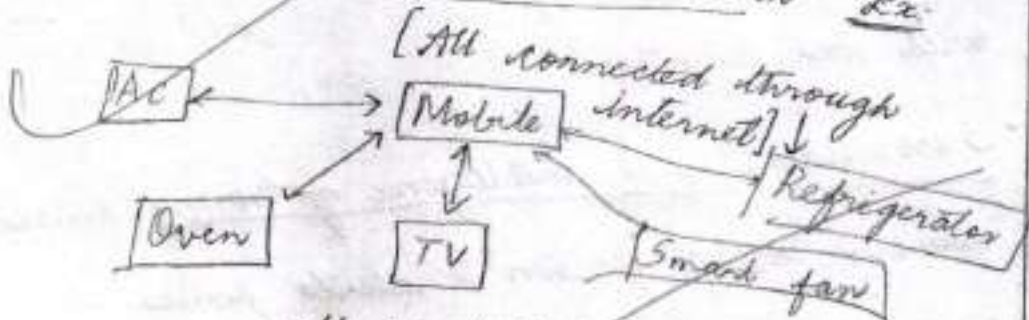
way forward?

- Launch of 5G radio lab (MIMO)
- Collaborative project of Ericsson to test 5G.

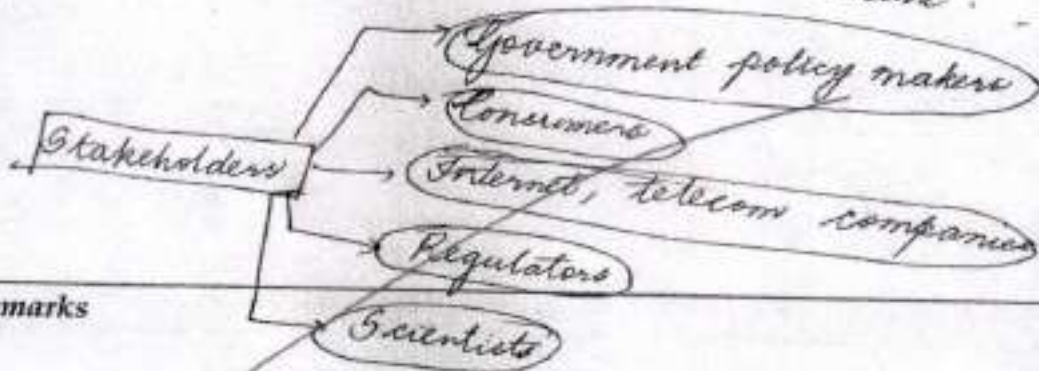
3½

Q7. It is expected that there will be more than 24 billion IoT devices on Earth by 2020. What do you understand by 'Internet of Things' (IoT)? Who are the major stakeholders in it? How will it benefit different industries? Examine. (10 Marks)

→ Internet of Things is a phenomenon where multiple objects are connected to each other either through internet or bluetooth. Ex.



If somebody forgets these on and leaves home, he could simply turn them off using mobile. With the rapid rise of internet, communication and smart technologies, IoT is on the ascendant.



Remarks

Benefit for Industries

• Brings in efficiency Ex: Turns off machine when not in use

• Smart transportation where cars communicate with one another

• Surveillance and intelligence gathering where camera detects person & alerts police

• Smart lighting systems and music systems where they go on/off based on human presence

• Education & health for real time communication & automatic information relay

3

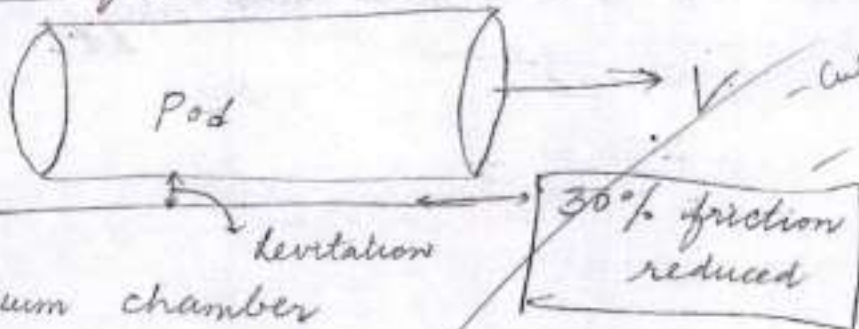
Discuss Industry Specific benefits

Military: Resource Allocation Troop monitoring

Agriculture: Crop Management Soil Analysis

Q8. US-based Hyper-loop Transportation Technologies (HTT) is in talks with five Indian states to build a high-speed travel network. Highlight the technology behind hyperloop and discuss its significance for India. (10 Marks)

HTT uses a vacuum based chamber to transport humans in pods. The pod is held by magnetic levitation.



It can attain speeds of upto 1000 kmph.

Significance for India

- Ultra rapid transit leading to time saving
- Technological advancement → Explain your point

Issues exist

- Lot of land needed and cannot be within

Illustrate about its background  
- Coined by Elon Musk  
- Virgin group of UK signed agreement with government of Maharashtra to study hyperloop region in the

Elaborate its working  
- Custom designed capsule drives test, estimated speed 1,000 km/h. Linear induction motor

Dis Ceds more points in significance :-  
- Share burden of railways & airways  
- Can withstand earthquake

Remarks



city

• Very expensive for Indian standard / explain this point.

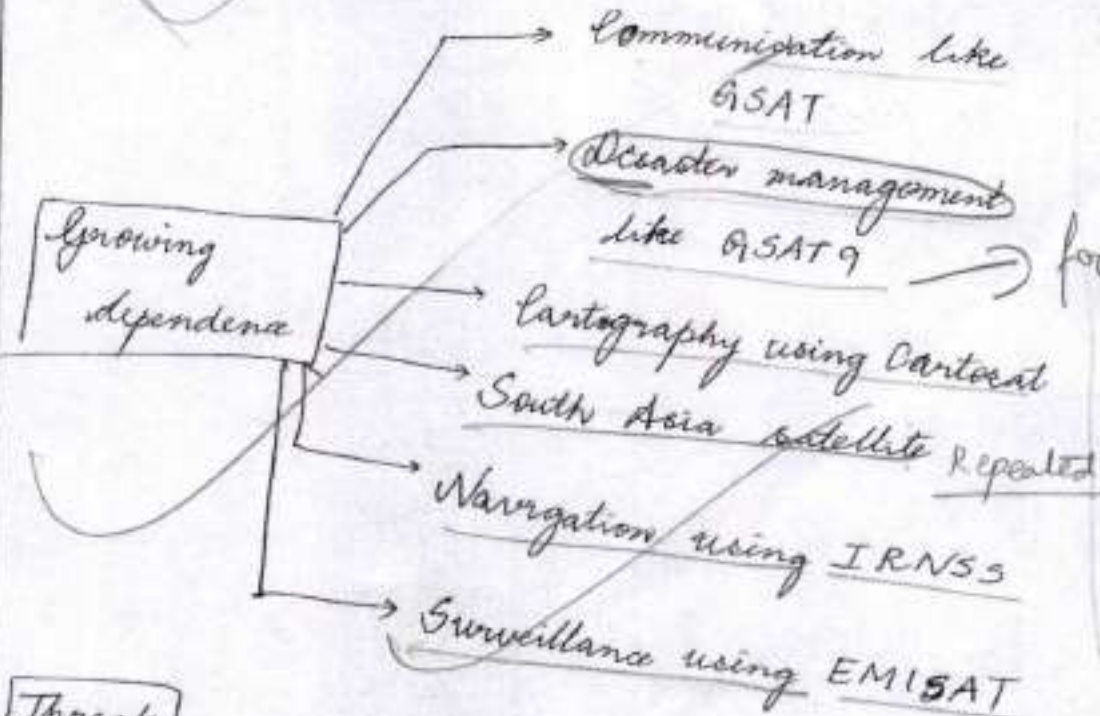
• ~~But if~~ However, newer technologies must always be welcomed &

Hyperloop is one such technology.

(2 1/2)

Q9. Owing to growing dependence of space resources it is important for India to protect its critical space assets and infrastructure from possible threats. In this context, examine the need for a Space Security Policy in India. (10 Marks)

→ Space resources include satellites and their transponders etc. India has had a successful space program so far.



for Communication between SAARC Countries

**Threats**

- Possible enemy attack using missiles like ASAT
- Creation of space debris that could collide into satellites.

Elaborate the threats  
↓  
Militarisation &

Remarks

Weaponisation of outer space, possibility of deployment of space based weapons.

• Cyber theft & hacking of space secrets & immobilizing space assets

Hence, a space security

policy is needed.

3

Discuss

what policies should be part of space security policy.

- Development of legal architecture
- Establishing a Space Command

Q10. Graphene was touted as "the next big thing". Many believe it could spell the end for silicon and change the future of computers and other devices forever. In this context, list out its potential applications. Discuss the challenges that are arising in the commercial use of Graphene. (10 Marks)

Graphene is a 2-D carbon allotrope. It is known to be a super conductor.



- ↳ Discuss its features:
- hexagonal pattern
  - strong, transparent, flexible
  - stable at room temperature

Why it could end silicon & change computers

- Very cheap in availability
  - Conductivity  $\sim$  100 times of silicon
- ↳ Graphene still confined to Labs

Applications

- Solar cells
- Quartz based piezoelectrics like watches
- Use in Printed circuit boards

Challenges

- Lack of sufficient R&D in it.

Relate Graphene to make these points self evident

Remarks

- Relatively difficult to handle
- Lack of human resources
- Industries have invested heavily in Silicon

Explain  
these points  
to make  
them  
comprehensible

Hence, a holistic policy taking  
all problems into consideration is needed.

2 1/2

Section - B

Q11. Environment Pollution Prevention and Control Authority (EPCA) recently recommended to the Supreme Court that Delhi's buses switch to H-CNG within the next two or three year. In this regard, what do you understand by Bio-CNG and HCNG? What are the advantages of Using H-CNG Vehicles? Also highlight the challenges. (15 Marks)

CNG stands for Compressed Natural Gas. It could be ~~of blended~~ classified into:

- Bio-CNG: CNG ~~blended with~~ <sup>extracted from</sup> natural sources like cow dung.
- H-CNG: CNG blended with 10-20% Hydrogen.

Relevant Explanation

The Delhi government had switched to CNG vehicles way back in the year 2001. However, CNG had to be imported from Qatar and Iran besides Russia. Besides; CNG is also a polluting fuel. To go more green, the EPCA recommended cleaner fuels like Bio-CNG.

Remarks

and H-CNG.

### Positives of Bio-CNG

- Cheaper fuel
- Net zero emissions lesser emission
- Adds to farmer income through schemes like Joban Dhan
- No change in vehicle engine needed
- Helps India live upto INDC commitments besides health

### Impact of H-CNG

#### Positives:

- Very clean burning fuel
- No changes in vehicle structure needed. Minor modification is required make it self explanatory
- Helps India develop newer technologies

#### Negatives:

- Hydrogen is an expensive fuel
- Storage is difficult as hydrogen can

explode.

- Lack of technologies to blend Hydrogen and CNG.

→ Way Forward

- Need to invest in H-CNG R&D and go for cross country collaboration with countries like Germany that launched CNG trains
- Incentivize private sector to invest in H-CNG buses
- Spread awareness about the same

4 1/2



Q12. Over-exploitation and loss of habitat is leading to the extinction of various plants, animals and microbial species. How is the Indian government attempting to tackle the issue? (15 Marks)

→ Extinction refers to the complete elimination of a particular species from Earth. IBPES report states that 60% of flora and fauna have become extinct since 1970.

Explain issue of Over Exploitation & loss of habitat

→ Impact of over-exploitation

- Deforestation leading to loss of flora and habitat loss for fauna

Briefly discuss significance of species diversity

→ Impact on plants

- Deforestation leading to elimination
- Loss of pollinators like bees
- Introduction of invasive species due to changed conditions Ex. Water hyacinth
- Soil erosion leading to loss of mineral rich

Analyse your points

Remarks

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

# UPSC

For practice use only  
प्रति अभ्यास के लिए

~~top soil / giving plants no nutrients~~

~~• Unsustainable cultivation leading to polluted soil resource~~

Impact on animals

~~• Construction of roads, electricity lines leading to accidents, electrocution etc.~~

~~• Loss of grass, etc disrupts food chain~~

~~• Pollution leads to death Ex Marine pollution on Yangas dolphin~~

Impact on microbial species

~~• Thermal and industrial pollution leads to coral bleaching due to loss of Zooxanthalae~~

~~• Death of algae due to environment conditions like temperature~~

Attempts being made by the Indian government

Relevant Explanation

(Please do not write anything except the question number in this space)

कृपया इस स्थान में केवल प्रश्न संख्या के अंकित रूप न लिखें।

# UPSC

For practice use only  
प्रति अभ्यास के लिए

- Creation of 2.5-3 BT of sink by 2030 under Green India Mission
- Animal specific projects like Project tiger, elephant etc. showing good results as reflected in tiger census.
- Environmental Impact Assessment is being carried out before projects
- Role of National Green Tribunal in awarding compensation etc.
- Mobile based applications like Koyla and others to send panorama of animals

Substantial by  
Citng  
- WCCB  
- Biological Diversity Act, 2002  
- Botanical Survey of India etc.

Irrelevant

4

Q13. The main factors contributing to urban air quality deterioration are growing industrialization and increasing vehicular pollution. Discuss the recent policy initiatives taken by the government in mitigating air pollution. (15 Marks)

→ India has 14 out of the 15 most polluted cities in the world. This is due to unplanned urbanization & industrialization.

Introduce different factors contributing to urban air quality

Role of industrialization

- Thermal power plants contribute to ~60% of the emissions
- Industries like tanneries in Kanpur let their run off into Ganga river
- Besides, cement industries contribute to dust, soot and other pollutants
- Software industry causes e-waste

Relevant points

Role of Vehicular pollution

- Burning of petrol and diesel releases CO<sub>2</sub>

Remarks

## Hydrocarbons and $\text{NO}_x$

- Old diesel vehicles cause much greater pollution including black carbon
- CNG vehicles contribute to methane
- The  $\text{NO}_x$  leads to ground level ozone which is a secondary pollutant.

→ Recent policy initiatives taken by government

### Industry:

- Perform, Achieve and Trade Scheme with Railways being the latest entrant
- Mission to Clean Ganga includes construction of effluent treatment plants etc. relate it with improvement of air quality
- Introduction of clean coal technology - scrubbers and electrostatic precipitators

nicey explained

- Mandatory use of fly ash in bricks and launch of apps like ASHTRACK.

### Vehicular Pollution:

- Leapfrogging from BS IV to VI standards impacting sulphur pollution the most
- Reduction of GST on EV's to 5%

- Mandatory Three Way Catalytic Converter in vehicles from 2020

[range of operation to reduce all]



Good

- Launch of FAME scheme to drive electric bus demand besides piloting EV's

- Giving impetus to electric 3-wheelers

- CNG buses in Delhi

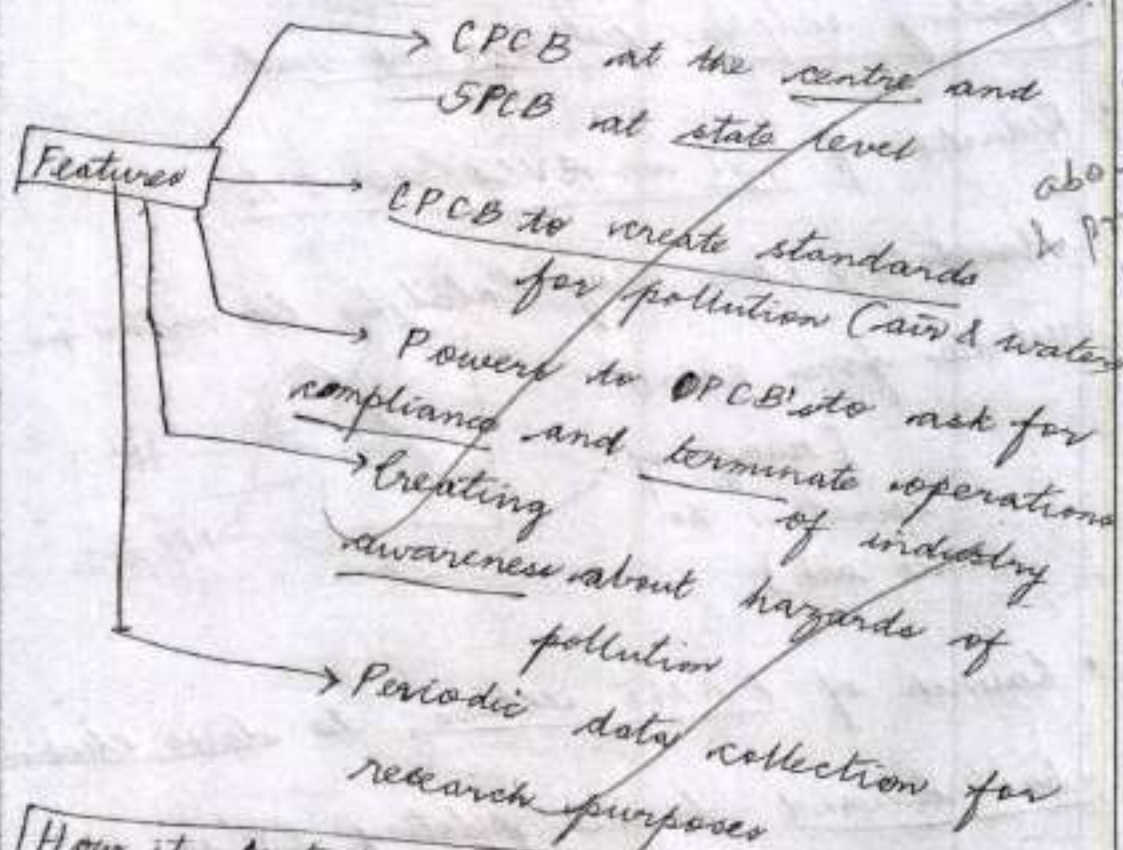
Conclude by National clean air programme

5:5

Q14. The Environment (Protection) Act was enacted in 1986 with the objective of providing for the protection and improvement of the environment. To what extent, the act has been able to live up to its mandate? (15 Marks)

The Environment Protection Act 1986 was enacted to give an overall direction to control pollution in the country.

Introduce about the need of environmental protection



Discuss about penalties & provisions for violation of the act; barring of jurisdiction of Civil Court

How it protects the environment

- Cracking the whip on emerging industries

Remarks

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

# UPSC

For practice use only  
विशेष अभ्यास के लिए

- Declaring certain zones as no-go zones thereby retaining their pasted value

How it improves the environment

- Conducting research and making specific recommendations
- Laying down <sup>stringent</sup> standards leads to good quality environment

Relevant Points

Successes of EPA 1986

- Many lakes, water bodies etc. have been rejuvenated. Ex: Pulicat lake
- Average pollution levels in places like Hyderabad have been growing at a slower pace. Explain this point

Failures of EPA 1986

- India has 14/15 most polluted cities in the world



(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

# UPSC

For practice use only  
प्रैक्टिस के लिए

- Loss of habitat for multiple organisms including fishes etc. due to water pollution
- Governance failure including integrity for corruption, honesty etc.

Relate this point with EPA, 1986

Environment is a serious crisis today and its very important for us to take it that way

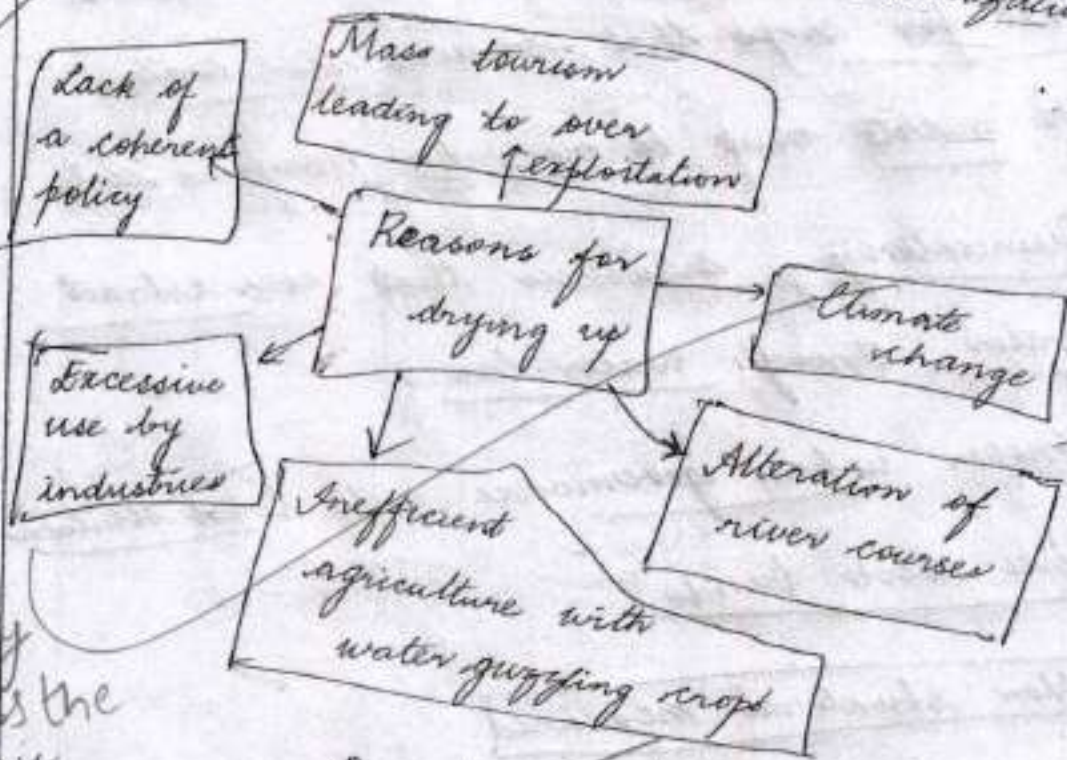
5

Q15. "Nearly 30% perennial springs in the Himalayan region have dried up causing water scarcity in the Himalayan region". Discuss the issue in light of Shimla water Crisis and suggest the need to implement structural and non-structural solution.

(15 Marks)

Shimla is facing an acute water crisis due to lack of underground water. This can be associated with rapid unplanned urbanization

Discuss the importance of Himalayan spring & their relevance in Shimla water crisis



Nicely Explained

Briefly discuss the economic benefits of Himalayan Spring sources

Due to the aforementioned reasons, springs have dried up due to lack of water from both underground & overground

Remarks

→ Structural measures needed

- Containment of tourism with hotels at the periphery of Shimla
- Massive afforestation; rain water harvesting
- MSP for crops that consume less water like millet must be more Ex: Haryana state
- Disincentivizing industries that over extract water through water tax
- Proper urban governance with local solutions like check bunds

not relevant

Good points

→ Non structural measures

- Spreading awareness through advertisements, campaigns like Jal Shakti Abhiyan

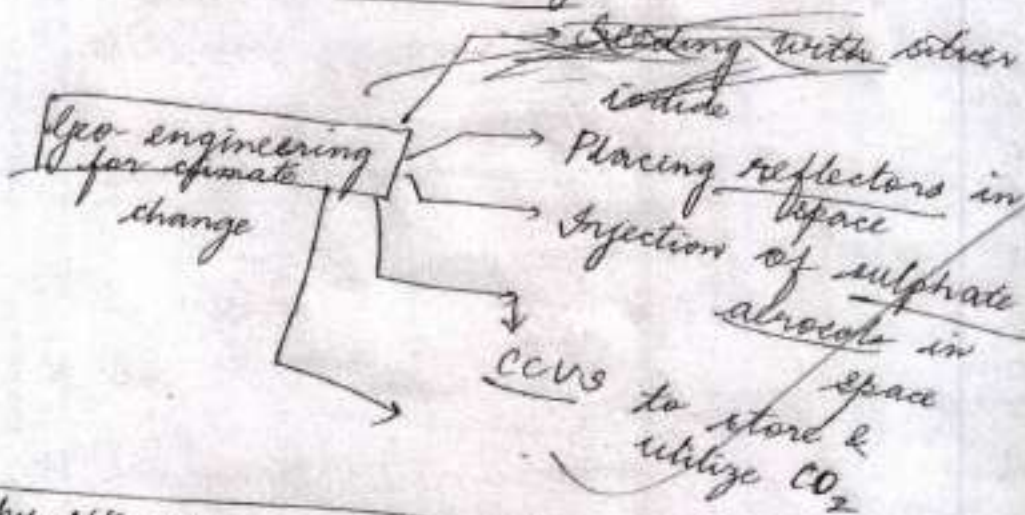
• Creation of a "Jal Volunteer" base like  
Swachh volunteer

• Awarding & rewarding water conservation efficiency.

(4½)

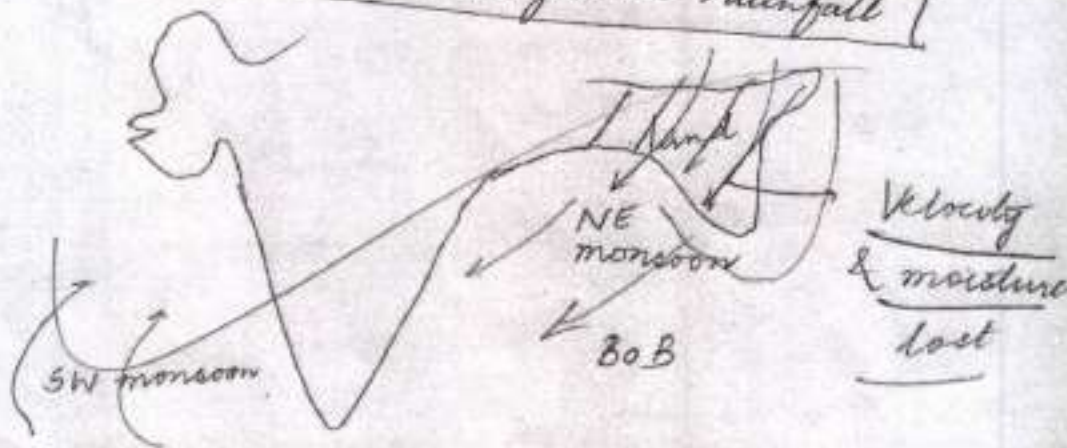
Q16. What do you understand by geo-engineering? Examine why North Eastern Monsoon brings less rainfall far below its actual potential and also critically discuss how geo-engineering can solve the problem. (15 Marks)

→ Geo-engineering refers to science based techniques to increase rainfall and dampen the effects of climate change.



Elaborate techniques of Genetic Engineering  
↓  
SRM (Solar Radiation management)  
& CDR (Carbon dioxide removal)

→ Why NE monsoon brings less rainfall



Remarks

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

For practice use only

सिर्फ अभ्यास के लिए

# UPSC

- NE monsoon, unlike SW monsoon flows over land first, losing all moisture
- It picks up moisture in Bay of Bengal, and discharges it on East coast of Andhra Pradesh & Tamil Nadu, but the Eastern Ghats are parallel to it and hence, rainfall is less due to adverse topography.
- Besides, NE monsoon winds are not as strong as SW monsoonal winds due to lower pressure difference & smaller velocity due to land. Hence, the water carrying capacity is also less.

Relevant explanation

→ Yes, geo-engineering can solve the problem.

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

For practice use only  
प्रश्न संख्या में लिखें

# UPSC

Elaborately explain these points

Geo-engineering techniques for rainfall

Seeding with silver iodide

Artificially injecting moisture

Whisking the clouds

not visible

Countries like Japan and states like Karnataka have successfully tried this.

4 1/2

Q17. Unregulated growth of urban areas without necessary infra-structural services and proper collection, transportation, treatment and disposal of solid wastes has resulted in increased pollution and health hazard from these wastes. Assess Swachh Bharat mission's efficacy on the matter. (15 Marks)

→ Solid Waste in India is at 62 MT p.a and is growing at 4% p.a. Clearly, the country is not prepared to handle a crisis of this magnitude.

→ Impact of solid waste

① Pollution:

- Leaching into groundwater leading to contamination
- ~~Landfills~~ Landfills release methane, a potent greenhouse gas

Plastics and other substances pollute the soil; making it unfit for cultivation

② Health:

- Burning of these wastes releases CO<sub>2</sub> and CO

Introduce about unregulated growth of urban areas & the reason behind relating infrastructure lacunae, collection, transportation, treatment & disposal of solid waste

Relevant points

Remarks



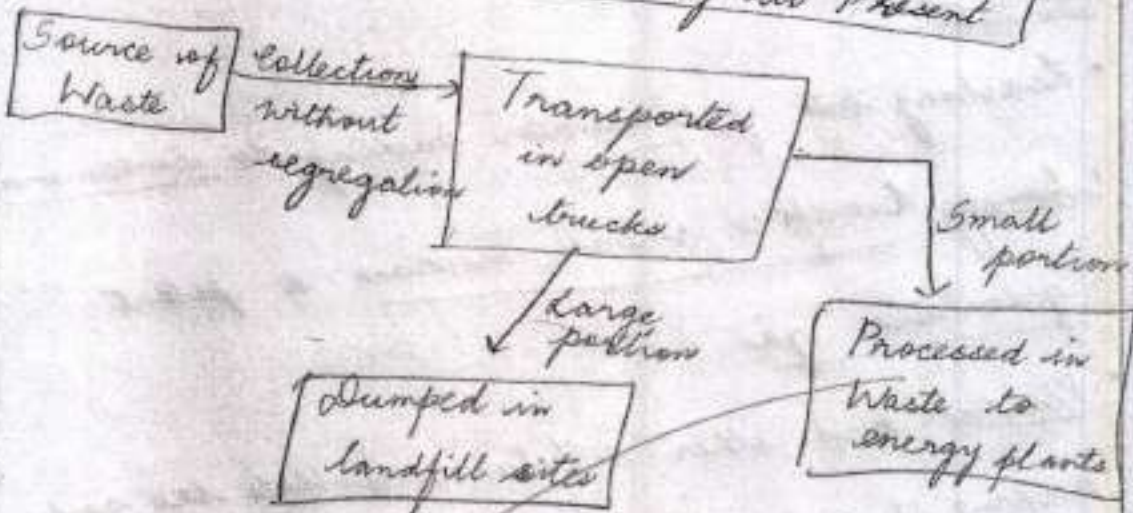
which lead to burning eyes, lung problems etc.

• Drinking contaminated water leads to typhoid

• Bioaccumulation of these wastes leads to  
thinning of bones besides impacting breast milk

• A high temperature environment created by  
these wastes impairs cognitive ability

### Mechanisms of Waste Processing at Present



good

less than 10% of the waste generated is actually processed. The Swachh Bharat Abhiyaan was brought in to check this.

## Performance of Swachh Bharat Abhiyaan

### Positives:

- Reduced open defecation and rise of ODF districts; reducing open waste
- Greater construction of Waste to Energy plants (WtE)

### Negatives:

- Lack of water etc. leading to insufficient utilization of toilets (only 95%)
- WtE plants still not sufficient to tackle the menace
- Lack of technologies to process newer kinds of waste being added Ex: e-waste and plastic waste.

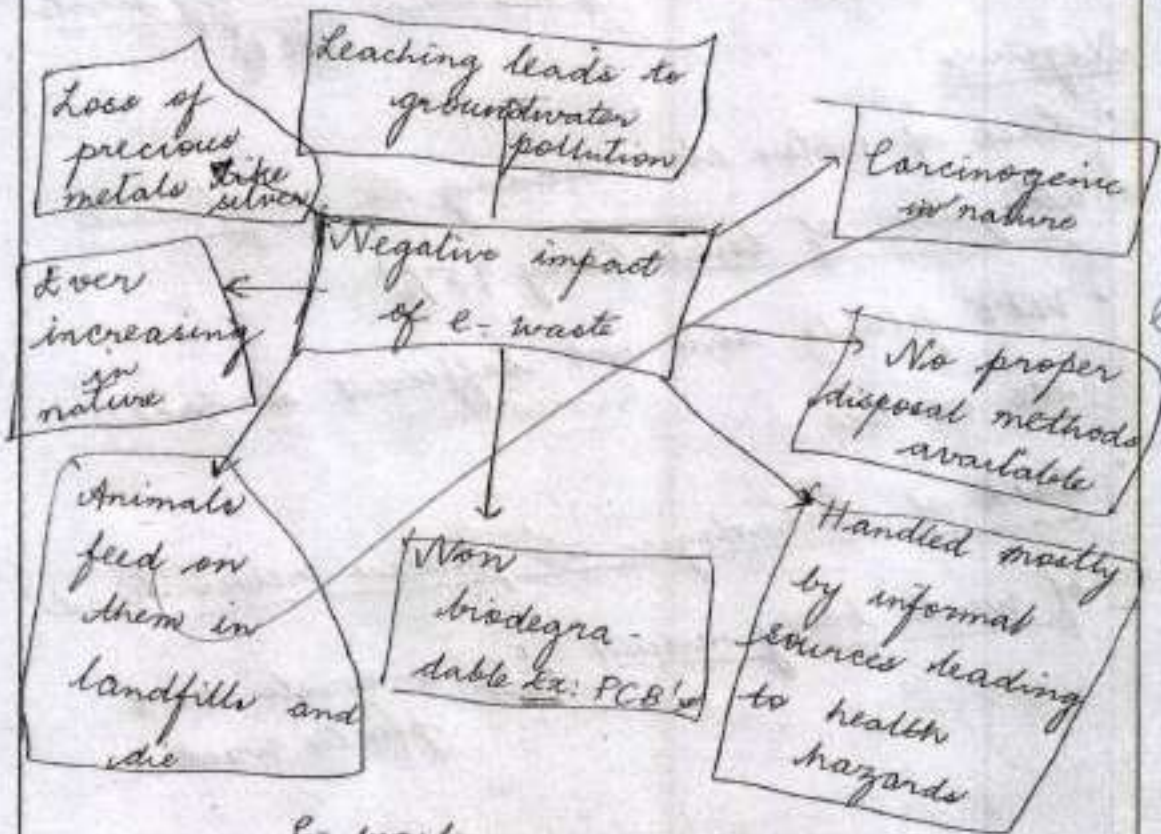
nicely explained

Highlight the efficacy of SBA in waste segregation



Q18. What is e-waste? A United Nations-affiliated group estimates that e-waste is growing faster than almost any other waste type. Examine how India can effectively manage its e-waste. Also briefly discuss the fresh rules that India recently brought in to govern the handling of electronic waste. (15 Marks)

Electronic waste (e-waste) refers to waste discarded due to mobiles, computers etc. It could be silicon, lead, silver etc.



*nicely explained*

e-waste is growing at a compounded growth rate of more than 20% - indicating the magnitude of the problem.

Remarks

Discuss the effective strategies to manage e-waste

- Waste as resource
- Behavioural change - Reduce, Reuse & Recycle
- Integration of techniques from other

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

# UPSC

For practice use only  
लिखें अभ्यास के लिए

→ ~~Measures to~~ Recent steps brought in by India

Did all key points of e-waste management rule, 2016

↓  
Did all about PRO & DRS

• Concept of Extended Producer Responsibility (EPR) where the producer has to bear the burden of waste

• ~~Electronic~~ Electronic products exported can be sent back within one year

• No import of e-waste is allowed

→ Measures needed to be taken

• Creation of recycling centres to extract precious metals like silver etc. There needs to be R&D on this

nicey explained

• Mandating that e-waste processing be done formally through use of gloves and other safety equipments

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

For practice use only  
शिक्षण के लिए उपयोग करें

# UPSC

• Concept of Recycle and Reuse Ex:  
The discarded PCB can be used for other plastic applications like chairs etc.

Ideas of circular economy need to be incorporated

• Creating incentives like buying back mobile phones after a certain period for a certain price

• Spreading awareness about the harmful effects of e-waste

way forward?

Segregation of waste, Reward & punishment for following or violating e-waste Rule, 2016.

Good

4

Q19. With the view of Regulating the use of drones in India, Ministry of Civil Aviation recently announced guidelines on drones that will come into effect from 1 December 2018. In this regard, mention the key features of the "Drone Regulation 1.0". Also highlight the various non-military applications of drones. (15 Marks)

→ Drones are Unmanned Aerial Vehicles (UAVs) that are powered and operated by a controller on the ground. Ex. Heron drones

Illustrate the role of Civil Aviation ministry in regulating drones.

Guidelines on drones and features

- Classification of drones into nano (< 1 kg), small, medium etc.
- Need for license to operate drones / discuss eligibility for license
- Prohibition of drones near and around metropolitan airports etc.
- Cannot be used for commercial purposes and can only be used for recreation

eligibility  
 ↳ 10th pass  
 ↳ 18+  
 ↳ English Speaking

Discuss about Zonation of air space, Digital Sky Platform etc

Non-military applications of drones

Remarks

- Use for shipping services like Amazon
- Crowd control during riots and other heavy situations Ex: Recent use in J&K after abrogation of Article 370
- Agriculture purposes like spraying of fertilizers; crop assessments etc.
- Film shooting these days is done using drones
- Rescue operations during disasters like floods and cyclones
- Security of VIPs as they commute

Relevant  
Explanation

→ Challenges involved in drone usage

- Can be used by anti-social elements like terrorists. An Intelligence report pointed at the same

- Come in the path of flights thereby causing posing a danger to lives
- Lack of sufficient number of instructors etc

### Way Forward

- Creating a market for drones by encouraging production etc.
- Encourage R&D in drones by incentivizing startups, IITs etc to publish IP's
- Create a pool of trained instructors → Explain this point

5



Q20. What is Robotics? Highlight its applications in Automobile, Military applications, Health & Medicine, Agriculture, Space Exploration and Banking sector. Also mention the objectives of Robotics society of India. (15 Marks)

Robotics is a field that deals with the study and applications of a robot. It is at the core of automation.

Applications of robotics

① Automobile:

- Assembly line robots for drilling, machining etc.
- Spray painting robots and conveyor robots
- Packaging applications like ~~box~~ placing components in a box
- Error detection robots to identify faults like machining tolerances etc.

② Military:

- Replacing humans in war zones
- Intelligence gathering through drones etc.

Relevant points

Remarks

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

# UPSC

For practice use only  
प्रति अभ्यास के लिए

## ② Health and medicine

- Robotic surgeries like the recent remote heart surgery with ultra precision
- Identification of diseases through pre-fed algorithms Ex: Robots identified skin lesions better than human doctors
- Designing new pharmaceuticals through the right combination based on need

## ④ Agriculture

- Automatic spraying of fertilizer
- Advisory services like growing certain crops based on predicted weather
- Mechanized farming including tilling, ploughing, sowing etc.

## ⑤ Space Exploration

- Use of landers and rovers like Pragyan in Chandrayaan 2

Good Content

(Please do not write anything except the question number in this space)

कृपया इस स्थान में प्रश्न संख्या के अतिरिक्त कुछ न लिखें।

For practice use only  
प्रति अभ्यास के लिए

# UPSC

- Extra terrestrial missions like Huygens
- Destroying enemy satellites through ASAT

## ⑥ Banking sector :

- Automated loan disbursal
- Identifying fraudsters and preventing hacking

## Objectives of robotics society of India

- Use of robotics for the purposes of betterment of humans including agriculture and other areas
- Development of the necessary HR and infrastructure besides capital & collaboration
- Ensuring robots do not harm human race

Give a brief background

↓  
registered on June 21, 2017

→ Promote teaching, training & research related to robotics

6