



**An Institute for Civil Services**

**IAS TOPPER'S**

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**Rank - 240**

**GS Mains  
S&T and Environment**



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# SCIENCE & TECHNOLOGY AND ENVIRONMENT

**Time Allowed: 3 hr.****Max. Marks: 250**

Q.	Marks	Instructions to Candidate
1.		<ul style="list-style-type: none"><li>• There are 20 questions.</li><li>• All questions are compulsory</li><li>• The number of marks carried by a question/part is indicated against it.</li><li>• Answer the questions in <b>NOT MORE THAN 200</b> words each. Contents of the answer is more important than its length.</li><li>• Answers must be written in the space provided.</li></ul> <p>Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.</p>
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Name KOUSHIK H R

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

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

Date \_\_\_\_\_

Signature Koushik H R

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

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

**Remarks**

**Q1. Nano-Technology is an "enabling technology" which influences a wide range of products and processes with far-reaching implications for development. Discuss the applications of nano-technology in water purification and food processing sector and how can it contribute for societal development? (12.5 Marks)**

Nano-Technology uses the nanoparticles which are very minute in nature and can have more advantages & uses.

Recently using nano-technology a membrane has been formed which has pores of the size of 50 nm which is considered to be tiniest. With this membrane, the efficiency of water purification is increased to a great extent. It can filter very minute particles & also can kill many bacterial & microbes.

Nano technology are being experimented to produce better particles & insecticides. We can use nanotechnology for ~~the~~ improving the production by gene transmission. Nano technology can be used in food processing industry to check the packaging to ensure it doesn't have any minute air gaps. Nano technology can be used to ~~to~~ tackle the microbial activity & preserve the processed food.

Nano-technology has a great potential in various walk of our life & this potential must be utilised in the proper sense.

**Q2. Recovery of radioactive wastes in Delhi's biggest scrap market, and the subsequent death and illnesses of the workers has raised serious concerns regarding the safe disposal of radioactive waste in India. Discuss the regulatory structure for dealing with waste in India and lacunas in it. (12.5 Marks)**



**Q3. The idea of empowering citizen and economic development just by increasing internet penetration through digital India programme is a misnomer. Discuss. (12.5 Marks)**

Internet is considered to be the driver of 21<sup>st</sup> century. Digital India programme aims to make internet penetration throughout India.

The positives of increasing internet penetration are many

- Better governance through e-governance model
- Improved education through tele education
- Improved communication. Even poor can communicate with the people
- Our people can be connected to the global world.

The question which everyone raises is can just internet penetration empower people & economic development and the answer would be a no.

Given India's poor literacy, internet would be like an alien to many of our people. It would be very difficult to use by many as computer literacy in India is very poor. Also in India we face stagnant power cuts and still



many villages doesn't have electric supply.

Given the above circumstances, we can say that internet is not a panacea, it is not an end in itself. Internet can be a very good means to achieve empowerment & economic development of the people.

- Q4. To approve developmental projects in protected areas, monitoring and evaluation, strengthening of infrastructure, addressing man-animal conflict and raising awareness is required. None of these are possible only through meetings in Delhi, but require local action on the ground. Critically analyse with respect to the functioning of National Board for Wildlife. (12.5 Marks)

National Board for Wildlife works towards wildlife protection & preservation of its habitat.

Despite having a national body, we see increasing problems for wildlife.

- There is an increased rate of poaching. Many animals are taking the trajectory of endangered & critically endangered.
- Habitat loss:- Habitat loss is one of the biggest problem faced by wildlife in India today. Wildlife habitats are being diverted towards mining & other developmental activities.
- Man-animal conflict is highly prevalent & the board doesn't have a very good record in preventing it.

Looking at the performance of the board we can say that decision making must be decentralised by taking local factors & players on board in order to achieve

better protection. ~~The folk~~

The following measures need to be taken

- Decisions must be based on local factors & conditions. One size fits all approach doesn't suit here
- Tribals & local population must be consulted & their opinion & feedback must be sought
- Increase local awareness by using vernacular language
- Reward the local community for their effort in wildlife protection

Given the declining wildlife population, National Board for Wildlife must take suitable measures at the local level & protect the forest & the wildlife

Q5. Radio frequency spectrum is a limited natural resource, it should be used judiciously and for common good rather than for private gains. Discuss the above statement with respect to the issue of Net Neutrality.

(12.5 Marks)

Recently Supreme Court of India ruled that radio frequencies are public natural resources & must be used for the betterment & benefit of public.

With the proposal of Internet.org & Airtel zero, India witnessed a huge debate on net neutrality. Net neutrality is the concept of providing equal access to the internet to everyone without any discrimination of which website the user tries to load.

Given the increased penetration of over the top (OTT) services like WhatsApp, Skype etc, Internet Service Provider (ISP) raised a hue that there is a loss of revenue & hence many ISP like Reliance & Airtel started programmes which would charge differentially to different website to increase their revenue.

Internet means interconnection of networks which are accessible by the users. They we cannot deny access to

a network for any user. This will defeat the concept of ~~not neutral~~ internet services like internet.org & airtel zero would kill the entrepreneurship in the long run. The e-market world would become a big power game suppressing the smaller players. Also it will ~~defeat~~ deny the liberty of the user to choose & access which a network he/she wants.

As ruled by the SC, internet must be treated as public resource & must be used for the benefit of larger public & not for economic gain of the players in the market.

**Q6. For ensuring transparency in the clearance of land for development projects, government has started online submission of application for Environment and Forest Clearances. Discuss the lacunas of this process and steps needed for strengthening forest clearance projects. (12.5 Marks)**

Govt has recently launched online submission of application for forest clearance. Though it is a good move, it has many lacunae

- Self interest is to be followed by the project and their reports can be distorted in their direction.



Q7. Smarter cities should be driven by goal of Self-sufficiency rather being hub of smarter technologies only. Discuss. (12.5-Marks)

The Union govt recently announced 98 cities for its ambitious smart city project. Smart city aims at ~~use~~ implementing smart technology so that the life of the people are improved by using such advanced technology.

Smart technology would improve the activities of the city, smart technologies in water supply, sewage treatment, infrastructure etc would improve the standard of living & would also attract investment.

Now we come to the major question that in smart technology the answer for our cities? What's the use of having smart technology if we are not self sustained? One of the major problems with Indian cities is that they are not self sustained. Most of the goods required for the city comes from outside.

Along with smart technology we have to also focus on self sustainability to make our cities 'smart' in real sense.





Q8. What do you understand by Environmental Justice? Discuss the role played by National Green Tribunal in achieving the Environmental Justice in India. Also elaborate the major hurdles faced by NGT.

(12.5 Marks)

Environment justice means the judicious use of the environment such that ~~the~~ the development & environment protection go hand in hand & our future generation would be able to enjoy the benefits provided by the environment.

National Green Tribunal (NGT) was setup through NGT Act in order hear the cases related to environment.

NGT has played a major role in achieving environmental justice.

- It has taken a tough stand against environmental pollution.

- It has ~~taken~~ cancelled many projects which were violating environment norms (POSCO & Vedanta).

- It has penalised the individuals & the builders involved in environment degradation. We can remember the hefty fine imposed on a builder for polluting the Bellandur Lake in

— Bangalore recently.

Though the NGT has a good track record & has great powers there are many hurdles which it face

- Poor Execution:- We often see poor execution of its orders.
- Increased no. of cases, pending cases would be detrimental to our environment
- Shortage of staff & environmental experts
- No suo moto:- According to NGT Act, suo moto the cases cannot be filed by NGT.
- Attempt to dilute its jurisdiction - The recent TSR Subramanian committee formed to look into environmental law has recommended to make NGT as a judicial review body for environmental law.

Since India has taken the path of inclusive development, NGT must be strengthened & by providing adequate funds & staff and its orders must be strictly followed in order to achieve environmental justice

Q9. With the increment in the space initiatives in India formulation of National Space Act for regulating space activities in India is must. Illustrate the contemporary issues for handling of which Space Act is needed. (12.5 Marks)

ISRO has achieved many milestone launches & has become the technology driver of the country. With the increased frequency of launches, there is an increased space activity. Hence govt is trying to regulate it by bringing the National Space Act. National Space Act tries to address many issues which the space programme faces.

- There is an increased demand for space activity from various sectors like communication, meteorology etc. National Space Act would provide provision in handling such requests.

- National Space Act would address the fund shortage faced by the institutions as it would promote the commercial launch.

~~• National Space~~

- ISRO is going towards the path of commercial launch thus earning huge revenue but presently there is no

proper regulations or commercial licenses  
National gas act would try to  
address this

**Q10. Clean Ganga Mission is old wine in a new bottle with the same focus on sewerage treatment plants. Elaborate. Discuss the major roadblocks in achieving the objectives of the project. (12.5 Marks)**

Ganga the national river of India is also the most polluted river. Hence the new govt has launched the Clean Ganga project. Mission to make Ganga a clean & non polluted river.

This is not the first programme launched to clean Ganga. Many former govt had launched programs to clean Ganga which turned out to be a failure because they couldn't address the core issue of pollution of Ganga river & instead just concentrated on the aspect of sewerage treatment. Even the newly launched Clean Ganga mission mainly focuses on beautifying Ganga by clearing the sewerage & the ghats what is required is not beautification but clearing.

Govt face the following hurdles in achieving its objective

- Technology :- We lack technology required to treat the pollutants &

clean the water.

- Corruption! - One of the major source of pollution to the river is the industries surrounding the river & they are able to violate many environmental guidelines due to the rampant corruption.

- Social attitude! - People consider Ganga to be a holy river & hence drop the offerings & half burnt dead body into the river.

- Coordination! - There is a lack of coordination b/w various departments & mainly b/w the states through which Ganga flows.

- Funds! - This mission requires a huge amount & the Namami Gange fund to attract NRI contribution & the tax exemption for the donation towards Clean Ganga fund might not be sufficient.

Government must take a co-ordinated approach & plan the activities suitably in order to clean the Ganga. Let us make Ganga famous as the National River of India & not as the most polluted river.

Q11. What is Digital Locker? Highlights the major benefits of Digital Locker system. How does Digital Locker differ from other such systems? (12.5 Marks)

Digital Locker is the cloud storage provided to any person having the Aadhaar card which he/she can use to store the documents and certificates and can be accessed through an authorised password.

The various benefits of Digital Locker are

- All important documents & certificates can be kept at one place & there is no risk of losing documents
- Govt. everyday receives a huge no. of requests for various certificates & documents requiring a lot of manpower to handle those requests. This can be overcome as the govt can directly upload the document to the digital locker
- This is a very important step towards e-governance
- People now need not make many visits to govt offices to avail the documents & certificates & can use put this time to productive use.



- Authenticity of the documents will be guaranteed.
- Unlike various other such schemes, Digital Locker is quite unique.
- It provides e-sign facility so that the user can sign the documents online.
- Easy accessibility:- It is very easy to avail the benefits of digital locker. One just need to have an Aadhaar number.
- The link of the file in the digital locker can be provided for many official uses which requires documents & certificates.

Digital locker is a very important step taken to achieve the objectives of Digital India & e-governance.

**Q12:** Discuss the major factors responsible for increasing Urban Air Pollution in developing countries like India. Also suggest some concrete measures to overcome this problem. (125 Marks)

Urban air pollution is increasing at a great pace in India. Delhi is now the most polluted city & the extent of pollution was witnessed when we had to import air purifiers from Sweden during the visit of Barack Obama.

The major reasons for urban air pollution in India are

- Electricity Generation :- A huge ~~part~~ part of the electricity we generate is by Thermal plants which use coal & are highly inefficient.
- Poor public transport :- Public transport is not very well established in our urban centres.
- Rapid industrialisation
- Increasing middle class and every household is now trying to have individual vehicles increasing vehicle density & then air pollution.
- Deforestation :- Forests act as a major carbon sink & hence can reduce the pollution.

The following measures need to be taken to reduce air pollution

- Promote green energy :- Alternate source of energy ~~in~~ like solar, wind energy must be promoted & their ~~power~~ technology must be improved so that they are viable option
- Improve public transport - The public transport system must be improved. Metro train & BRTS etc are good approaches
- Improve the efficiency of the thermal plants & reduce the pollution from it by ~~use~~ going for critical & super critical plants.
- Pollution from industries must be strictly regulated & the violators must be penalised.
- Increase the public awareness towards using public transport & changing the lifestyle which leads to lesser pollution.
- Increase the green cover of the urban centres by planting trees on the sides of the road (green highways)

Q13. Discuss the major physical and economic effects of climate change on water resources across the globe. (12.5 Marks)

Climate change has a huge effect on the water resources of the world.

### Physical effects

- Increased water temperature could lead to decline in plankton
- Increased evaporation due to increased temperature can increase the salinity of the ~~sea~~ water bodies.
- Due to glacial ~~melt~~ melt, there could be an increased load on the water bodies like oceans & seas.
- Because of climate change, we are witnessing depleting water resources on one hand & on the other hand we are even witnessing floods.
- Due to increased sediments, we are witnessing eutrophication & algal blooms.
- The marine animals have taken a hit. Many marine animals are migrating towards colder regions.

### Economic Effects

- Decrease in marine resources has hit the fishing industry which provides

employment to many

- Many coastal regions are being submerged due to sea water rise leading to huge human & habitat loss and also rehabilitation & resettlement hits the country's economy.
- Increased events of floods & cyclones has a huge economic impact on many river banks & the coastal region are high production areas.
- The changes in the ocean ecology has created a challenge to address environment pollution as ocean act as ~~ocean~~ carbon sequester & environment pollution has a huge economic impact.
- Decreasing water resources has posed a great challenge on many developing countries who are dependent on agriculture.

Climate change has a very huge impact on ~~the~~ all the aspects of our life & this is an issue which cannot be addressed individually. Hence all countries must come together & address this

Q14. An innovation ecosystem is a combination of two distinct economies, knowledge economy and the commercial economy. In this context illustrate the major challenges faced by India's innovation ecosystem and entrepreneurship. (12.5 Marks)

For any innovation it needs both the knowledge & a commercial value for the innovation.

The major challenges faced by innovation ecosystem & entrepreneurship in India are

- Education System :- Our education system is focused more on rote learning & gives very less significance to innovation & researches

- Poor research platform :- Govt spends more on establishing new IIT & IIM for political gain & doesn't give much importance to improve the research infrastructure

- Sub In India the researches are not industry oriented.

- Poor funds :- Many new entrepreneurial ventures die down due to fund shortage.

- IPR regime :- We don't have a standardised IPR regime which act as an impediment to new innovation

- Tough govt laws :- Our govt laws is like bankruptcy law etc pose a challenge to new entrepreneurs.
- Govt must address these challenges by following measures
  - Improve the education system & promote inclusive & research oriented learning.
  - Provide more funds for research & promote new innovation instead of reverse engineering.
  - Provide better avenues for angel investors who can provide huge funds for startups.
  - Liberalise the laws like bankruptcy law in order to promote entrepreneurship.
  - Provide better physical & digital infrastructure.

Govt along with At Make in India is promoting Start in India which is a right dirn to harness the huge innovation & entrepreneurial potential complemented by the Skill India.

Q15. India has recently committed to expand the share of non-fossil-fuel energy to 40% by 2030. Discuss the implications of it for the economic and sustainable growth of India. (12.5 Marks)

India ~~is~~ recently ~~publicly~~ submitted its INDC in which it has committed to increase its non-fossil fuel share to 40%.

This move has a huge implication

- It reduces the environment pollution & decreases our carbon footprint
- With a decreased carbon footprint we would have more bargaining power in the climate change negotiations & can force the developed world for technology transfer for adaptation & mitigation.
- We can arise revenue through carbon trade
- Deforestation would be reduced due to decreased coal mining
- Reduced emissions will improve public health & govt can divert some share of money spent on public health to other areas like employment generation.
- It would help in achieving environmental justice.



Shifting to non-fossil fuels has many challenges

- Presently non-fossil fuels are not very costly and it wouldn't be very easy to shift until their price is made competitive
- It requires advanced technology which India lacks.
- It requires a huge investment & it would be challenging to raise such a huge revenue.

India must address these challenges & make sure that it sticks with commitment to make India a better & healthier place to live.

Q16. Define the "Polluters Pay Principle". Discuss the major difficulties in implementing Polluter Pays Principle in developing countries like India. (12.5 Marks)

Polluters Pay Principle is the principle of holding the polluter responsible for the pollution & imposing fine on him/her for polluting the environment.

Polluter pay principle has given rise to what is called carbon tax imposed by many countries for the carbon equivalent emitted into the atmosphere. Though India doesn't have any implicit carbon tax but we have explicitly used it by having high excise duty on the fossil fuels, clean energy etc.

India faces major difficulties in implementing polluter pay principle.

- India is in the developing stage & many industries are growing & such principles can be detrimental to economic growth.
- We are heavily dependent on fossil fuels like coal & petroleum & other alternatives

are in the nascent stage

- It can lead to increased cost and it would be difficult as we are already battling ~~of~~ inflation & poverty.
- We ~~do~~ don't have technological ability to switch to better technologies & reduce emissions.
- We have very poor per capita income & such indirect taxes could be a ~~to~~ burden.

Q17. Environmental sanitation is a major public health issue in India. Do you agree? Discuss various intervention strategies related to environmental sanitation in India and also highlight major challenges faced in achieving the desired outcomes. (12.5 Marks)

- Environmental sanitation causes huge health issues. It leads to various diseases like diarrhoea etc.
- Environmental sanitation would also lead to the soil degradation & pollution of water bodies leading to many water borne diseases.

Major challenges being faced are

- Infrastructure! - We have very poor infrastructure with very less penetration of toilet facility
- Water availability
- Social attitudes of the people
- Caste divisionism

Swachh Bharat Abhiyan tries to address this problem



**Q18. Define the term 'Biosimilars'. How do biosimilars differ from the original innovator medicines? What role biosimilars can play in the near future? (12.5 Marks)**

Bio similars are the medicines obtained through bio technology which has similar features & functions as the conventional medicines.

Bio similars are produced through a various biological research & process and they have a lesser side effect as compared to original innovator medicines.



Q19. The conventional 'Gun and Guard' method of conservation is no more effective in dealing with the socio-ecological complexity and political dimensions of biodiversity conservation. Comment. (12.5 Marks)

India traditionally used the 'Gun & Guard' method for forest protection & conservation but this has not given very good results.

• The society around forests & the ecology of the forests are changing rapidly & hence we cannot go for such a traditional approach. Now there is an international market for forest products & wildlife trade, we see increased role of left wing extremism in the forests and many tribes have become hostile towards the forest authorities. Due to their continuous exploitation.

• Now there is a large huge network among poachers & smugglers & it would be very difficult to address this issue & control it by gun & guard approach.

• We are seeing diverse activities in forests while smuggling was mainly in sandalwood in Southern region now sandalwood smuggling has been reduced due to strict vigilance &



many other trees like red sanders have topped ~~chard~~ the chard.

- Many political parties, pressure groups, NGOs are taking the cause of forest protection.

Hence we need to shift from traditional gear & guard method. We can try to ~~to~~ use the following measures.

- Increase the role of tribals & the forest community. Which also provides employment to them
- We must use modern technologies like camera traps. Kerastak govt's 'Hejje' app for tiger conservation is a good move in this approach
- The forest dept must be provided with sufficient economic & human resources & they must be provided with better equipments.
- Public awareness must be increased.

**Q20. E-waste export to the developing countries is governed by brute global economics in which market forces, if left unregulated, dictates that the toxic waste will always run "downhill" on an economic path of least resistance. Elaborate. (12.5 Marks)**

Many developing & under developed countries have become a dumpers for e-waste generated in the developed world.

The developed countries are promoting export of e-waste by luring economic funds to the developing & underdeveloped countries. For the desire of economic benefits, many countries are allowing dumping of e-waste neglecting the longterm negative effects it would have.

The developing & under developed countries doesn't have the technical requirements to process the e-waste. It also needs huge investment. e-waste pose a great health hazard as it has many heavy metals like mercury & cobalt & many other <sup>toxic</sup> pollutants which can enter the food chain and affect the health.

Many of these countries are already fighting with poor health & e-waste would increase the burden.

The global community must take this issue seriously as for the economic benefit of the developed world we cannot transmit toxicity to the global South.

The e-waste export must be strictly regulated by bringing international convention which addresses the issue such that the developing & underdeveloped countries do not become the dumpyard of the e-waste & ~~they~~ in case of such dumping they are provided with sufficient resources & technology to ~~handle~~ treat it.