

# Science & Environment

Time Allowed: 3 hr.

Max. Marks: 250

## Instruction to Candidates

- There are 25 questions.
- All questions are compulsory.
- The number of marks carried by a question/part is indicated against it.
- Answers must be written in the medium authorized in the Admission Certificate which must be stated clearly on the cover of this Question -cum-Answer (QCA) Booklet in the space provided. No marks will be given for answers written in medium other than the authorized one.
- Word limit in questions, if specified, should be adhered to.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

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Date 17 Oct 2014Signature P Jain

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

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

Q 1. "Space research in India is moving towards the goal of reducing digital divide". Elaborate the steps taken recently and its implication? (200 Words)

Space Research in India is primarily focused on sending satellites in outer space. ISRO has sent 2 types of satellites for this purpose: ① Indian Remote Sensing (IRS) ② Communication satellites (INSAT series).

Space research has helped towards reducing the digital divide in following ways →

- ① Remote sensing has helped in meteorological studies which has helped the farmers.
- ② Satellite series like INSAT have helped up in setting up long distance wireless communication.
- ③ Using VSAT technology, villages have been connected.
- ④ Satellite like EDUSAT have helped in education purpose & helped in connecting digital have nots in rural areas with others.
- ⑤ Helped in successful implementation of various gout programmes like NeGP and NOFN and recently in Digital

India programme

The implications of Space Research and its help in reducing digital divide are →

- ① Enhanced literacy rate
- ② Enhanced digital literacy at lowest level.
- ③ Have improved healthcare facilities by connecting medical staff in rural areas.
- ④ Disaster management.
- ⑤ Accurate forecast have helped in agriculture and has helped in record food grain production.
- ⑥ Space programmes like Chandrayaan 4 MOM have established India on world platform.

Q 2. India has been declared Polio free. Whereas India has not been able to handle the issue of TB; suggest some of the urgent measures required for eradication of TB? (200 Words)

TB with 5.5 lakh deaths last year has emerged as the largest killer of the masses. TB has remained a challenge to be eradicated with almost 25% of TB affected patients globally are in India.

Government has ~~sent~~ launched Reinforced National TB Control Program (RNTCP) in 2012-13 to tackle with the problem of 'silent killer'.

India can take a cue from its success in eradication of polio from country and remaining polio free for past 3 years.

Some of the suggested measures are →

① Awareness campaign must be launched at grass level just like done for polio in 2000, by roping in famous personalities.

② Increasing the govt expenditures on health. The largest problem is out of pocket expenditure which is around 3:1 according to National Health Profile 2013.

- ③ TB has been made a notified disease in 2012.  
But still improvement has been not there  
as many private doctors don't comply by it  
& treatment
- ④ Patients leave the country in between thus  
thereby leading to antibiotic resistance.  
Proper monitoring mechanism should  
be there to avoid MDR-TB
- ⑤ TB drugs are available as over the counter  
medicines thus leading to its misuse &  
abuse. It has to be stopped.
- ⑥ TB is an airborne disease. cleaning the  
environment would help.
- ⑦ Improving overall health infrastructure  
facilities in country where doctor: patient  
ratio is 1:1200.
- ⑧ Replacing old serological test using  
blood serum for detecting TB is a 125 yr  
old process & replacing with GeneXpert  
and molecular assay tests.

Q 3. What do you understand by stealth aircraft? What is the significance of stealth technology in modern warfare? Discuss India's attempt in developing stealth technology. (200 Words)

Stealth aircraft is a fighter aircraft using stealth technology. Using this technology, aircraft is not visible on radar and hence can fly undetected. It uses various methods

- ① Streamlined aircraft design.
- ② coating with special material which absorbs radar waves.
- ③ Release of plasma gas in atmosphere around aircraft to avoid detection.

This technology has immense significance in modern warfare because →

- ① Advanced & cheap technology has made it possible for every nation to access modern weapons.
- ② Terrorist outfits also have radar & anti aircraft guns.
- ③ To hide & attack at enemy's strategic locations.

Various stealth aircrafts are F-35 Lockheed Martin, B-52 and T-35 made by ~~Russ~~ USA Russia.

India is also planning to build a fifth generation fighter aircraft (FGFA) with Russia.

India has used stealth technology in various defence components →

- ① FGFA
- ② INS Komarta
- ③ Astra air to air missile
- ④ Brahmos supersonic cruise missile.

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Q4. What is Ballistic Missile Defence? Why does India need BMD? Discuss the status of BMD programme of India. (200 Words)

Ballistic missile defence is a system designed to protect from attacks of Ballistic missiles. It is a combination of acute sensors, radars, satellite and missiles to protect, detect and destroy the attack of enemy from airborne strikes. Eg: Iron dome BMD of Israel which it used to against Hamas in 2013-14.

India is surrounded by 2 neighbours Pakistan and China with which we had militarily confrontations in past. Changing global scenario & geopolitics have made India vulnerable to external attacks. Hence, India needs a BMD to protect its land, people & sovereignty.

India is developing its BMD system. India has had integrated missile development programme in 1980s. which gave us range of missiles - like Prithvi, agni, akash series.

India's BMD works at 2 levels →

- ① Endospheric
- ② Exospheric.



Exospheric defence means to destroy ballistic missile during its free fall fight itself.

Endospheric defence means to destroy the attack when it is in earth's atmosphere.

- India has developed Prithvi missile defence for endospheric purposes. It attacks the missile at altitude of 50-100 km.

India is also developing its exospheric defence capabilities.

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Q5. Explain the mechanism of drug regulations in India. What are the recent developments in this field? Why should move towards generic medicines? (200 Words)

India follows a stable drug pricing policy according to which cost of around 600 drugs are regulated by the govt which has established National Drug Pricing & Policy committee.

India follows a selective approach where some life saving drugs prices are regulated while others are based on market forces.

\* India also produces large number of generic drugs which are very cheap and life of poor patients. It produces generic drug of life saving drugs.

India has obtained a licence under WTO regulations through which it produce drugs at cheap rate without paying any high royalty to its original producers.

Recently, SC dismissed the cases of Bayer and Novartis over issue of patent approval over their life saving drugs Gleevec. SC dismissed the case and said that mere tweaking of chemical composition doesn't amount of innovation.

India should move towards generic medicines because →

- ① Large poor people both in India & world.
- ② High class medical facilities are not available cheaply.
- ③ Poor countries are more prone to be affected by life threatening diseases.
- ④ These drugs require efforts & time because to be designed. And with poor R-D facility, so, it won't be possible to survive with meagre resources.

**Q6. What is Green Tobacco Sickness? Discuss its causes, symptoms and prevalence in India. (200 Words)**


Q7. What do you mean by patent? What are the benefits of a patent? Formulate a strategy to increase patent registration in India. (200 Words)

Patent is a right given to protect product of intellect. It is a right given to protect a product or process or both and to prevent the use of that thing for commercial purposes without the consent of the original creator/inventor.

The benefits of a patent are →

- ① It protects the rights of creator.
- ② Avoid use of the product/process for commercial gains in unregulated way.
- ③ Encourages creativity and innovation.
- ④ Gives proper monitoring of the new innovation and its effects.
- ⑤ It let the creator to enjoy the benefits of his product by paying him royalty.

To increase patent registration in India following ways can be used →

- ① Enhancing a detailed plan & policy.
- ② Establish a link between innovators and government.
- ③ Strict implementation of the patent policy.

- ④ involving people in decision making process.
- ⑤ Encouraging creativity and innovations in school itself.
- ⑥ Promoting Training institutes to harvest demographic dividend.

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Q8. Why was the Middle East respiratory syndrome corona virus (MERS-CoV) in news recently? Explain what risks does it pose to India and critically evaluate the Indian preparation to control it in case of a major outbreak? (200 Words)

MERS-CoV was a corona virus which caused respiratory diseases in the people. It spread like endemic in middle east region with high mortality & morbidity if affected.

It is believed that camels are host of MERS-CoV and it may pass to human body through aerosol particles present because of camel's milk & urine.

It possesses various risks to India ⇒

- ① Large population of India live in a congested location thereby increasing the chances of infection.
- ② Indian diaspora working in middle east is at highest risk.
- ③ Unknown and new virus. Hence, no vaccine developed yet.

India have taken various measures

- ① screening of passengers coming from middle east.



However, India doesn't stand prepared to protect itself from MERS in case of an outbreak →

- ① no vaccine available
- ② poor healthcare facility
- ③ poor health infrastructure
- ④ screening is only taken during ~~hazard~~ a risk. Not done in normal day to day process.

Q9. Critically assess cancer as a threat to public health security in India.  
(200 Words)

Cancer is a threat to public health security in India because →

- ① Large population consume tobacco in some form of other which leads to lung cancer.
- ② Passive smoking
- ③ Less awareness among masses.
- ④ Unavailability of cheap treatment.
- ⑤ Stigma associated and fear of cancer.
- ⑥ Polluted environment has amplified the adverse effects.
- ⑦ Treatment quality better in private sector.  
However, cancer is not deadly as much as TB affects the Indian population. ~~Moreover~~, It is because →
- ① Deaths are less because of different stages whereby patient gets chance to get proper treatment.
- ② Rise of private hospitals providing treatment
- ③ Active participation of many NGOs

groups to help in funding of poor people.

However, with rising pollution levels and increase in tobacco use with sedentary lifestyles, number of patients with cancer are increasing day by day.

Poor public healthcare facilities are big deterrent from masses to move towards private health care sector.

Government needs to not only promote cost benefit light on pocket treatment as well as improve healthcare facility to improve the services provided.

Q10. Discuss the applications of robotics in ocean research and rescue missions. (200 Words)

Robotics presents an opportunity in ocean research and rescue missions

Robotics can be used in all those areas where : ① Danger to human life is perceived. ② Human reach and aid is not accessible.

Robotics are being developed for this purpose only where human intervention is not possible properly.

The various applications are →

- ① Deep sea research :
- ② Deep sea drilling for oil .
- ③ Deep seabed trawler to study the sea floor .
- ④ Geological studies .
- ⑤ archaeological <sup>explorations</sup> findings →
- ⑥ Use of robotic arm to rescue people stranded on inaccessible areas .

		GS SCORE

Q11. Explain the significance of forensic audit? (200 Words)



Q12. Critically evaluate Indian efforts to combat climate change. (200 Words)

India is third largest emitter of greenhouse gases after China and USA. India is a signatory to Kyoto protocol and Montreal protocol. India has done various steps to combat climate change →

- ① India has generated around 30GW of energy from renewable sources.
- ② India plans to increase solar energy production upto 20,000 MW by 2022 through JNNSM.
- ③ India has undertaken highest number of clean energy projects in 2013 using CDM and Joint implementation methods.
- ④ India has a very low carbon footprint compared to USA, China, UK, France etc.
- ⑤ India has reduced its carbon emission levels ~~from~~ around 20% from its 1990 levels.
- ⑥ It has undertaken many projects through Global funds for climate change.

2013

- ① CDM
- ② JI
- ③ JNNSM
- ④ CPI
- ⑤ Tom
- ⑥ Ren



① It has started GRIHA Rating Systems which use rating system to buildings which is managed by Bureau of Energy efficiency.

However, India is still third largest emitter of greenhouse gases it also although give green energy ratings to buildings but they are given arbitrarily without any proper checks and evaluation.

The industrial pollution levels are alarmingly high in New Delhi which is the most polluted city in world. India needs to enhance its efforts to combat climate change and not wait on others to do so. India should follow common but differentiated responsibilities principle but must also increase its accountability.

**Q13. What do you mean by bio-remediation? Discuss the importance of bio-remediation in India's effort towards sustainable development. (200 Words)**


Q14. What do you mean by solid waste management? Discuss the challenges of solid waste management in India. Bring out some success stories. (200 Words)

Waste generated from cities can be classified into 2 groups → ① solid ② liquid. The ~~top~~ solid waste disposal is a major issue both for administration & urbanisation apart from its environmental concerns.

The challenges associated are →

- ① Differentiation between organic & non organic waste is not done at the time of waste collection.
- ② Collection of waste is more of an administrative challenge as it is generally contracted to private organizations.
- ③ Method of disposal → Shortcoming resources have made landfilling unsustainable whereas gasification and ~~incineration~~ burning the waste create pollution through smoke.
- ④ Landfilling is making the land infertile and the waste is also seeping into groundwater.
- ⑤ Increasing e-waste which contain hazardous compounds are creating

trouble for administration.

However, there have been some solutions →

- ① increasing community participation which included segregation of waste in form of recyclable & non-recyclable stuff.
- ② Allocation of waste collection on an auction basis to private contractors.
- ③ Gasification of solid waste instead of burning it.
- ④ Rock Garden of Chandigarh is a famous example of use of solid waste for decorative & artistic purposes.

Q15. Discuss the major threats to wildlife conservation in India. Explain measures taken by the government and different agencies in conserving wildlife in India. (200 Words)

The major threats to wildlife are →

- ① Infrastructure projects which run through many forest areas. eg: railway lines etc.
- ② Deforestation which removes the animal from its natural habitat.
- ③ Mining projects leads to habitat destruction.
- ④ Rise in pollution levels have led to risk of extinction of many species.  
eg: vulture because of diclofenac & sparrow because of mobile radiation.
- ⑤ Poaching of wild animals for their hides, bones which are used for smuggling and for traditional medicinal purposes.

Different measures taken by government for protection of wildlife in India are →

- ① Prohibition of Hunting of wild animals for recreational purposes.

Infra  
Indus  
Mimi  
Poach  
POTU

TGP  
PETA  
BWL

~~WSS~~

FRA

~~WSS~~  
BP

~~WSS~~

AT

PE

PE

PO

Vulture

SAVE

- ② Setting up National Parks, wildlife sanctuary and Biosphere Parks to provide wildlife a natural habitat with min. human intervention.
- ③ many conservation programmes have been launched to protect individual species. Eg: Project Tiger, Project Elephant, Crocodile, SAVE (Vulture)  
Project Hangul etc.
- ④ many civil society groups have also worked to work for wild life conservation. eg: TERI, PETA, Beauty without cruelty.
- ⑤ Awareness program among masses to sensitivise them for wildlife conservation.

Q16. What are the reasons for declining birds' population? Discuss the steps taken by GOI and global institutions to safeguard migratory and domestic species of birds. (200 Words)

The various reasons for declining birds population in India are →

① Electromagnetic radiation →

Birds like sparrow have almost gone from the urban areas of Delhi because of mobile radiation.

② Bioaccumulation →

Cattlepain killer Diclofenac accumulates in water as it ~~is~~ doesn't decay or decompose which act as a toxin for water.

③ Meat consumption →

Birds like amur falcon, a migratory bird is killed in oragaland for local consumption. Similarly others are also killed in tribal areas.

④ Illegal trafficking →

Exotic birds like Peacock, Macaw etc are illegally trafficked to other countries for their exotic plume & feathers.

⑤ Hunting →

Great Indian Bustard stands at critically endangered position because of hunting.



from Pakistan's side for recreational purposes.

⑥ Development →

Birds like Narcosundum Hornbill and Nicobar megapod face extinction because of developmental activities in Andaman Islands.

The steps taken by govt are →

- ① India has signed CITES treaty under CMS convention.
- ② India has prohibited hunting of birds etc.
- ③ Developed Bird sanctuaries at many places.
- ④ Launched programs to save individual species. Eg. Vulture. (SAVE Program)
- ⑤ Awareness generation among masses.

Q17. What are the reasons of wetland loss in India and steps need to be taken to manage the wetlands? Discuss some of the initiatives taken by courts in this regard. (200 Words)

India is home to 3% of world's wetlands according to Indian Forest Survey report 2013.

India is also signatory of Ramsar convention according to which 26 wetlands are in the Ramsar list. ~~Recent~~ The reasons for wetland loss in India are →

- ① Deforestation which leads to dying of wetland trees
- ② Use of water for irrigation purposes lead to decline in underground water.
- ③ Reclamation of land for "urbanization"
- ④ Increasing pollution and discharge of sewage in the groundwater which in turn pollute the wetland.
- ⑤ Rise in population leads to use of source of water for uses which pollute them.

Wetlands are the rich biodiversity areas which not only are home to flora but also habitat various fauna. Hence, it become necessary to protect & conserve these wetlands

① Defor  
ESZ  
② Irrig  
Ground  
water  
③ Recla  
④ Ram  
⑤ 3%  
⑥ Pollu  
Lakes  
to clean

Recent SC court verdict on establishing the Okhla wetland in Delhi as ecologically sensitive zone is an important step in this regard.

Q18. Environmental governance introduced by international bodies aims at improving the quality of human living within the carrying capacity of supporting ecosystems. Elaborate with respect to role played by UN in sustainable development. (200 Words)

The concept of sustainable development as envisaged by Brundtland Commission in 1980s aim at using natural resources without taking away the rights of future generation. Since then UN has taken a proactive role in sustainable development. For this purpose Earth Summit was held in Rio in 1992 under aegis of UNEP which for the first time brought the focus of countries towards climate change, biodiversity & sustainable development. Every year one conference of parties (COP) is held for climate change (UNFCCC) which decide on future steps for protecting the climate. Kyoto protocol is a result of UNFCCC only.

For sustainable development, UN launched millennium development goals in 2000 which aimed at promoting sustainable development. It had 8 objectives which dealt with variety of issues like:

- ① Removing Poverty & hunger.
- ② Reducing child mortality ratio & maternal mortality ratio.
- ③ providing universal education.
- ④ providing drinking water and sanitation facilities etc.
- ⑤ Promoting global partnership.

Individual targets were given for many nations which were to be achieved by 2015. Many nations achieved their targets and India also performed decently in field of education, poverty, disease etc.

For future, UN has decided a new set of goals from 2015 known as sustainable development goals (SDG) which would be adopted in Cop-20 to be held in Paris in 2015.

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**Q19. Environmental degradation has a major negative impact on welfare of women. Elaborate. (200 Words)**

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**Q20. Discuss the challenges faced by institutional bodies in nation states during the implementation of International laws related to environmental protection. (200 Words)**





Q21. E-waste mining in India belongs to an unorganized sector. What are the hazards related to it and how concept of extended producers responsibility can help in controlling the menace related to it in India. (200 Words)

E-waste mining in India belongs to unorganized sector. More than 90% of e-waste is handled by ragpickers etc.

The hazards related are →

- ① Direct exposure to the hazardous substance leading to health problems
- ② E-waste also contain inflammable substances which may cause explosions
- ③ Lack of awareness lead to haphazard disposal of e-waste which lead to further pollution of environment thereby mixing with elements -

Government is thinking of bringing Extended Producer Responsibility to deal with e-waste management. Since, people are not aware of the harmful effects as well as the components of e-waste, this should be responsibility of producers to take

back the e-waste. Since the producer also have funds and awareness, therefore he is in a better position to tackle with problem of e-waste. eg: IT companies and hardware dealers like Nokia, Dell, HTC have started taking back the e-waste products in their outlets. Only a proper legislation & enhanced responsibility on producer side can help in controlling e-waste menace.

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Q22. In the light of successful 'Mars Orbiter Mission', critically evaluate the ISRO's capabilities for cutting edge, outer space exploration missions. Also, sketch the bottlenecks in its path to become one of top 3 space research agencies in the world after NASA and European Space Agency. (200 Words)

GSTV  
SRV  
REC  
Man  
Miss  
ISS  
spendin.  
funding  
BD.

ISRO's Mars Orbiter Mission is a phenomenal achievement which has put India in an elite club of nations who have sent missions to Mars. With this success, India has proved its ability to reach into outer space.

However, one must note that it was only a technology demonstration mission which was a prototype mission for its future missions.

ISRO has capabilities for cutting edge, outer space exploration missions which have been proved by PSLV which has emerged as workhorse of ISRO.

However, India's outer space missions would be considered successful only when ISRO is able to send heavier payload in future which require GSLV, and cryogenic engine which give strong thrust.

In order to become one of the topmost space agency of world, ISRO need to overcome following bottlenecks  $\rightarrow$

- ① Development of cryogenic technology.
- ② Development of Recoverable Capsule which could be used for ~~manned~~ future projects.
- ③ Reentry vehicle on the-lines of space shuttle program of NASA.
- ④ Setting up a permanent space station like ISS, Soyuz, Mir.
- ⑤ Manned Mission has to be started.
- ⑥ Problem of Funding which is even less than 1% of India's GDP.
- ⑦ Human Resource is needed which we recently drains to NASA, ESA etc.

If ISRO, can overcome following bottlenecks, it can emerge topmost space agency in world.

**Q23. Critically evaluate the 'Namami Gange' project in the light of various Ganga Cleaning Projects taken up by Indian Government and other government bodies so far. How this program has to be different in terms of both policy and execution, to be successful? (200 Words)**



Q24. Bt Brinjal was a technology triumph but a commercial failure. Discuss  
(200 Words)

Bt-Brinjal, is a genetically modified crop which uses gene of bacillus thuringiensis which is added to Brinjal's seed and makes it more resistant to pest attack. This innovation of producing a transgenic organism was a technology triumph but a commercial failure.

It became a commercial failure because of fears over its long term effects on land & human health.

- ④ The reasons for it being a commercial failure are →
- ① Inability of farmers to buy seeds.
  - ② absence of irrigation facilities which produced low yield.
  - ③ Inability to payback the finances. credit



④ Opposition by civil society groups which led to govt. putting a moratorium over its production.

⑤ Uncertainty over its future leading to halt in further research of Bt - Brinjal.

It all led to sale of Bt brinjal to be a loss making venture. Add to it the negative publicity it generated in minds of masses, made it a commercial failure.

→ X ←

Q25. Discuss contributions of any two of the following scientists: (200 Words)

- (a) Dr M. S. Swaminatham
- (b) Hargobind Khurana
- (c) J. C. Bose
- (d) S S Bhatnagar
- (e) Birbal Shahani

(a) MS Swaminatham is known as the father of Indian Green Revolution. He along with Norman Borlaug, introduced hybrid seeds of high yielding variety in rice & wheat in 1986 and helped India to overcome its food deficiency problem.

(b)

b)

J.C. Bose

J.C. Bose is considered a pioneer in field of long distance communication

- ① Demonstrated long distance wireless communication for over a mile.
- ② Demonstrated the plant's response to external stress and stimuli.
- ③ His long distance wireless communication method was used to develop radio by Marconi.

