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Science & Technology

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SCIENCE AND TECHNOLOGY

Consolidated questions and answers from Insights' Science and Technology Daily Answer Writing Section.

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INTRODUCTION

Below are the 'Best' Answers to the Questions posted at Science and Technology section on Insights.

Answers are not perfect, but they would certainly help you in this moment to get some idea when Mains is only a few days away.

This document is for the benefit of candidates writing Mains this year (2013) and also for aspirants preparing for 2014 exam.

We would like to thank *Tauseef (IIT Delhi)* who collaborated with us to send questions and reference links.

Many aspirants have written excellent answers to many questions. One can access all of them [here](#), but for those appearing for Mains-2013, this document would suffice for now.

Excuse us for not organizing the document properly. It is done in haste. But it's still useful.

Good luck for Mains – 2013.

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- **The government's nod for shale gas extraction is in violation of India's effort to abide by the international and national environmental laws? Critically analyse. (250 Words)**

The government's announcement for shale gas exploration at a few identified locations may seem to be an economically viable alternative than importing crude oil and natural gas to reduce the growing current account deficit but a closer look reveals that it clearly reflects the myopic vision of the authorities in delineating a clear road map for harnessing the benefits of shale gas on sustainable basis.

The actual process (hydraulic fracking) uses large amount of fresh water mixed with chemicals (some of which have been identified to be carcinogenic). Experiences over the last decade in US (the sole proponent of shale gas) have shown that it leads to substantial environmental damage by polluting ground water aquifers in the surrounding areas. In the Indian context, it may serve the purpose of reducing the fuel imports but would also cause irreversible damage to public health and belie India's position at various environment and climate conferences internationally. The chemicals on getting mixed with ground water will enter the food chain and will severely affect public interest. Also it has been proved that shale gas leaves a greater carbon footprint.

India being a party to various climate and environmental conferences internationally has always taken the lead in designing its own environment friendly regulations by passing various acts after the 1972 stockholm declaration like The Water (prevention & control of pollution) Act 1974, The Air (prevention & control of pollution) Act 1981, National Environment Tribunal Act etc. Thus the decision taken by the govt. is in clear violation of its own promises and commitments. The way forward for the policymakers is to first carry out a feasibility research fitting in the indigenous conditions before jumping into a mad rush to explore shale gas. (The government's announcement for shale gas exploration at a few identified locations may seem to be an economically viable alternative than importing crude oil and natural gas to reduce the growing current account deficit but a closer look reveals that it clearly reflects the myopic vision of the authorities in delineating a clear road map for harnessing the benefits of shale gas on sustainable basis.

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- **“Promoter cannot be regulator”. Discuss on the validity of the statement based on the Pesticides Management and Regulations in India? Suggest improvements to the status of the Pesticides Management Bill,2008, that is still pending in the Parliament. (250 Words)**

Highlighting pesticides management and regulation, there are many systems, rules and structures in place in India, like agriculture ministry regulates the manufacture, sale, distribution and use of pesticides, health and family welfare ministry defines permissible residual limits of pesticides in food commodities, Registration Committee of Central Insecticides Board approves the use of pesticides and new formulations on crops and also advises central and state governments, implementation of regulations is done by state governments, etc.

But despite such systems and rules, the recent tragedy in Bihar, in which some 25 children died after eating pesticide-laced mid-day meal in school, shows there are flaws in the present system and rules. Analysis shows that present structures and rules promotes the use of pesticides without giving proper consideration to regulatory measures. Increased limits of pesticides above tolerance limits in food commodities, lack of infrastructure and manpower to check for presence of pesticides, ineffective implementation of food safety laws, lack of research on permissible levels of pesticides makes the whole system ineffective. Consider the case of endosulfan. Despite being its toxic in nature, India stood against the decision to globally ban endosulfan owing to pressure from its manufacturing companies as India is one of the largest producer of endosulfan. This shows the veracity of the fact that PROMOTERS CANT BE REGULATORS as those who formulate and promote pesticide are incompetent or unwilling to curb its manufacture and use.



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To address the above issues, Pesticides Management Bill,2008 has been placed in Parliament, which will repeal the Insecticides Act,1968. Increased inspection by pesticides inspectors, no registration of pesticides without specifying tolerance limits, establishment of Central Pesticides Board, etc are some of the provisions of the modified bill. To make the bill more appropriate, improvements can be made as awareness generation among farmers of excessive use and side effects, more research on permissible tolerance levels, strict enforcement of food safety laws,etc.

- **The draft DNA profiling Bill,2012, advocates the principle of “ enhancing protection of people in the society and administration of justice”. Analyse. (250 Words)**

The use of DNA evidence in criminal cases has been prevalent all over the world since the 1980s. Though there have been various arguments against the scientific veracity of such evidence, the courts have been amenable to the use of DNA evidence to prove or disprove criminal cases.

The Draft DNA Profiling Bill proposes to establish a national level DNA database which will be supported by state level databases. It proposes to create various indices with DNA profiles of the accused, the victim and other suspects in a crime scene as well as of unknown deceased persons and missing persons. The offences for which DNA profiling is applicable and where it may be used for the identification of the perpetrator of crime have also been listed out. Thus, the Bill provides for the use of DNA profiles from the database to match with those found at a crime scene, which will assist in identifying the offender.

However, DNA evidence is not fool-proof and false matches are a definite possibility. Also, the right to privacy of an individual should not be compromised. The Bill needs to address the issue of confidentiality of the samples, about how the samples will be handled once the profile of an individual has been created, and also as to when is the consent of the individual required for collection of samples.

The Bill thus attempts to enhance protection of people as well as to improve administration of justice. However, there is a need to address the limitations so as to achieve its objective completely.



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- **“The core of nanotechnology lies in its interdisciplinary nature”. Comment (250 Words)**

Engineering and manufacturing research in the atomic and molecular level is on since the discovery of nanotechnology. Owing to high surface area to volume ratio such nano particles show distinctive properties which has found wide application in different areas such as medicine, space , food , consumer products , environment , electronics and energy.

Nanotube sheets can generate electricity from waste heat , improve fuel and solar cells efficiency & can be used to generate cheap sustainable energy. From environmental viewpoint nanotechnology can be widely used for combating water , air pollution through use of nanoparticles as catalysts , nanostructured membranes and nanofiltration. Superfast processors, new memory types ,nanodots and quantum computing are based on nanotechnology for more storage , processing power and faster computation. OLED's and LED's use nanocrystalline structure for better efficiency and carbon nanotubes are being used in displays. From drug delivery to diseased cells , diagnostic imaging , antimicrobial techniques , repair of specific diseased cells , healing and repairing specific tissues, to curing cancer nanomedicine has wide uses. Molecular tools which help in disease diagnosis is being researched in the field of nanomedicine. Nanosensors find use in space operations , nanoparticles used in spacecraft manufacturing make lighter vehicles facilitating economical space travel. In Food , nanoparticles enhance the nutritious content of food without altering its look and taste, silver nanoparticles as pesticides , nanocapsules and molecular treatment of crop diseases are some applications in agriculture. Because of easy absorption nanoparticles are finding its way in cosmetic products , in other consumer products such as fabric nanoparticles reduce weight and thickness and improve quality ,they are also used in sports manufacturing.

Nanotechnology has wide potential in significantly improving human lives with faster , better and economical ways by interlinking all possible arenas in our day to day life.

- **“There is an urgent need to adopt technologies for gainful utilization and safe management of fly ash.” Discuss. (250 Words)**

Fly ash is the residue generated during the combustion of coal and lignite, usually in the power plants. Due to high-ash content in the Indian coal, large amount of fly-ash is generated in coal-based industrial activities. This fly-ash when discharged into atmosphere, can cause serious



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respiratory ailments like Tuberculosis and lung cancer. Moreover, the settling of fly ash over large tract of fertile lands encroaches the agricultural area, and also impacts upon the fertility of land.

With increasing awareness, India has been looking for the profitable deployment of the residual fly ash. Department of science and technology, has started a program on management of fly ash. Research done by C-FARM, a central organization engaged in management of fly-ash, suggested that fly ash can be used to increase the forest area by landfilling and also it could be helpful in reclamation of wastelands. Experiments done in Orissa, have demonstrated the efficacy of fly-ash in its ability to promote afforestation.

Other identified uses of fly-ashes are, their utility as of reinforcing agents in building materials and Portland cements. It can reduce the strain on limited building material and fire-brick available for faster construction purposes. Its mixing with cement has shown improvements in the quality of building material.

More research and private interest is required in exploring the full-potential of fly-ash, it will not only reduce the hazards of a pollutant but would also be economically beneficial to various stakeholders. Government should also dedicate its focus on effective management of fly-ash. (Rahul Agrawal)

- **“The dark energy and dark matter has proved to be elusive for physicist around the world”. Comment. (200 Words)**

The Universe has always been a very interesting phenomenon to study. It is said that it started with a big bang, and from then on, it has been expanding. The more it expands, the faster it expands. It is believed that all the universe that we can observe is a mere 4%. The rest is a mysterious force called dark matter and dark energy.

Even though a lot of sophisticated scientific instruments are available for accurate measurements on this planet, scientists still are left clueless about this exotic invisible force – aptly called dark matter. With $E=mc^2$ formula, we can see that dark energy is much more than we realize.



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The universe is full of matter, and matter attracts every other matter due to gravity. So, the dark energy should be much stronger than the gravitational energy to make all the galaxies to recede away from each other. So, the most mysterious phenomenon to plague scientists' minds had been dark energy and dark matter. This has proved to be elusive to all physicists of the world without proper data and a theory which isn't fully deciphered yet.

- **Highlight the issues associated with the increased patenting in the biological domain especially in the light of recent controversies and verdicts? Do you think patenting biological forms is desirable? Substantiate. (250 Words)**

A patent is a document which promotes innovation and discovery. It gives the sole rights regarding the ownership of the product to the patent holder. Hence, the IPRs are well guarded, by legal means using patents. They ensure a healthy competition and awards the true discoverers.

But, these days large companies patent products which are traditionally known to indigenous people. For eg., American companies patenting Indian or Amazon tribal herbs or other plants/animals secreted proteins for their own commercial benefits. This is guarded by TRIPS.

The CBD in 1992 ensured that the countries from whose borders the samples of various plants are taken by the companies, can be controlled. Therefore, this way, the developing countries safeguard their indigenous innovations by not letting other companies steal them away. They impose various compensations and other limits to collect samples for the research done by scientists in the companies.

Scientists argue back, by saying that, they collect lots of samples from different countries. After researching on them for over a decade, only one or two will go into clinical trials. Even this drug, may or may not be a blockbuster to get the company millions of profit. So, they argue that, paying compensation for just collecting samples is a huge hindrance for the innovation in the company.

Patenting in human genes, had become a huge issue recently. The US SC has announced that human DNA on genes cannot be patented, but cDNA can. So, patents can be given only after some modification of a natural product.



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Hence, patenting, as a technique is desirable in the biological domain to save many lives. But, it should not take away the credit from the indigenous inventions. Patenting, should be done on inventions and not on discoveries.(Akand Sitra)

- **Discuss the issues related to clinical trials in India? What are the implications of Supreme Court's latest ruling in this regard. (250 Words)**

Indian laws encourage clinical trials to a greater extent but the gravest concern from the vantage point of Indians and ethicist is the illegal and unethical clinical trials. Post liberalization many pharmaceuticals and MNC's found great deal of interest in developing nations and found India, one of their main hubs for untested clinical trials.

In support, Drug and Cosmetic Act, 1940, proved to be an efficient tool for them and the nexus between regulators and operators grows indefinitely. The DCGI which controls the clinical trial proved inefficient and granted many untested clinical trials in last two years which led to thousands of deaths and created havoc. Hitherto, there is no concern for subject on which clinical trials are done due to which big firms and the regulators nexus have flourished in profit maximization.

They set their own ethical committees where members are from regulators. High handedness and nexus have governed the clinical trials with disastrous consequences and many untested drugs that are banned outside are tested easily. Indian council of medical research (ICMR) which looks after clinical trials had proved to be a failure because they do not have the authority to stop trials. Several such loopholes in the laws have paralyzed our system and proved to be inefficient till strict regulations have been formulated by Indian Supreme Court.

Recently, Supreme Court intervened as a result of a PIL by health activists and NHRC intervention and found lack of governance in clinical trials in India and slashed the controlling authorities putting ban on untested drugs and using Indian as guinea pig. In lieu of this a bill named Drugs and Cosmetic Regulation, Bill, 2013 is drafted to amend the act of 1940. Now clinical trials will be monitored by Health ministry. Under new norms it will be mandatory for the companies to compensate the patients who may suffer death or any severe problem.

Furthermore, there is an urgent need for independent ethical committees which will look after the conducts of regulators. They will decide about the compensation and standard of testing drugs on patient.



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Supreme Court further directed the regulators to have video recordings of drugs in trials so that effective measures are taken while operating patients.

Due to SC's stringent directions many big pharmaceuticals have abstained from further business in the field of clinical trial and it has been seen as a great loss for Indian health enterprises. Many eminent advocators of clinical trials see this as a great loss for India and research in the field of health and medicines. No doubt this will hamper our medicinal and health research which is in dire need of assistance but effective laws and people's life are equally important which are the backbone of our democratic principles. (Tauseef)

- **“India has become a surrogacy haven”. Comment on the recent issues and controversies related to surrogacy in India. Do you think ART, Bill, 2010 is strong enough to tackle the issue. Suggest measures to improve the vitality of the bill? (250 Words)**

Availability of huge population of poor women, approval of commercial surrogacy by supreme court in 2005 and weak regulatory conditions have contributed in making India as a preferred destination for surrogacy in form of Assisted Reproductive Techniques(ART). A major chunk of medical tourism is directed towards benefits arising from ARTs in India. Despite the increasing popularity, there are issues of safety, ethics and rights in the whole process of surrogacy. The level of compensation, effect on health of surrogate mothers, and effective monitoring of child and mother has become a challenge in the field of surrogacy.

To provide an ethical, just and non-exploitative framework of surrogacy, government has come up with Draft ART Bill 2010. Although the intent of government in regulating this field is appreciable, still the bill is having various ludicrous provisions. Some of these provisions are:

a) Revised schedule of payments: Bill has proposed the 5 step payment cycle in which 75% of the payment would be done in last tranche. This shows utter disregard for maternal physical and emotional health issues

b) Definition of couples: Bill has defined couples as unmarried, married or single person in a sexual relationship permitted legally in India. It has not taken into consideration of scenarios like gay couple



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c) Restriction of ARTs cycles: Though it has limited the maximum number of cycles a 3 per couple, but it hasn't restricted the number of couples. Given the high rate of failures, this may seriously jeopardize the health of surrogate mother.

Thus, though a progressive ARTs legislation is the need of hour to ensure effective regulation of surrogacy, but the ART bill in present form suffers from various deficiencies.

- **“Evergreening” is a major obstacle in legal allocation of patents. Comment (100 Words)**

Patents are necessary to promote the culture of research and development. In case of pharmaceuticals, new discoveries are essential to save people from the new forms of pathogens and existing diseases like cancer, AIDS, Tuberculosis, etc. Recognising this many countries including India strengthened the patent regime through allocation of product patents and also for complying with the WTO TRIPS regime. But multi-national companies are trying to extend their control over life-saving drugs by making small changes to the molecules without any benefit to the therapeutic value and applying for the patents for these drugs. This actually results in evergreening of patents beyond their stipulated period and denying access to cheap generic drugs. The recent Supreme court verdict in the Novartis case has helped in stopping such a scenario. But India is under pressure from developed countries of European Union and the United States in acceding to the TRIPS plus protocols which supports the evergreening of patents.

- **Comment on the significance of blue water navy for India? (100 Words)**

Blue Water Navy is one which is equipped with Aircraft carriers so that it can operate in deep international waters. This capability enables it to play a greater role in the international geopolitics.

The significance of BWN for India is multi -faceted and with the growing hegemony of USA and China in South East Asian Region, it is imperative for India to work towards full fledged advancement in this field.

The growing influence of Chinese “sphere of influence” has threatened Indian strategic importance as most of our economic activities are governed through international waters.



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Therefore it is important to safeguard our trade routes for which significance of BWN is imperative.

Further many illegal activities, terrorism and piracy are of great concern for maintaining peace along Indian coastal regions in the wake of Mumbai attack. Also, it is equally important for India to safeguard its bilateral and multilateral relations with South East Asian Nations for which India should come forward as a responsible nation and build confidence among its partners.

The development in the field of Aircraft Carrier, though lethargic, but is of great importance. India inducted INS Vikramaditya recently which was modified version of Russian carrier. India needs to indigenize its technology for further development as it is way below the advanced versions of carriers used by developed nations. India is in talk with USA for CATOBAR technique which is the most efficient one. Moreover there is a dire need of defense developments to be infused with aircraft carriers like Airborne Early warning System, Missiles and Nuclear Submarines that are equally important for an efficient BWN.

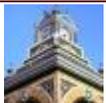
Recent induction of INS sudarshini and Ratnakar are only a step further in acquiring the most sought status of BWN which will further prove India's strategic credibility among its partners.(Tauseef)

Note: definition of BWN involves having just aircraft carriers. Nuclear submarines, deep sea air bases, military satellites too are part of BWN. You must mention GSAT-7, INS Baaz, INS Chakra – these are part of India's BWN efforts and assets.

- **“Gene Therapy offers wide range of prospects for humans”. Comment.(100 words)**

Gene therapy is the insertion of genes into an individual's cells and tissues to treat a disease. Although the technology is still in its infancy, offers wide range of prospects for humans in treating various degenerative diseases like Parkinson, Alzheimer and Diabetes and other single-gene defects, such as cystic fibrosis, hemophilia, muscular dystrophy and sickle cell anemia & also offers preventative gene therapy (PGT).

In Parkinson treatment gene therapy, works by inserting billions of copies of a gene into patients' brains that helps them produce more GABA. Likewise, PGT involves the repair of a



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gene with a mutation associated with a progressive disease, prior to the expression of a medical condition, to prevent that expression. Recently, in Cancer treatment BRCA1 and BRCA2 genes mutation for breast cancer are sorted out and fixed through gene therapy. Remarkably an Indian Scientist developed Baruah siRNA “a biological weapon that prevents diseases before the translation processes happen and stops transmitting them from generations to generations.”

However issues like gene doping, death and serious ethical issues are the major impediments to be resolved albeit we can say- It was a Distant Dream: Now it is the Reality”

- **Comment on the significance of LHC experiments.(100 words)**

LHC experiments aims to prove the existence of “God Particle”, or Higgs Boson. Higgs Boson approval will complete the Standard Model of Particle Physics, which describes the subatomic world of elementary particles and fundamental forces of interaction among them, except gravity. The elementary particles of theory cannot have mass without Higgs Boson. In particular, this will help cosmologist to understand the evolution and origin of entire universe in terms of known laws of physics. The probability of solving mystery of dark matter and energy will increase and the future expansion of universe can be predicted. Further it will open new fields in cosmology for the thousands of physicists working for experiment.

- **Critically evaluate the nuclear programme of India?(250 words)**

India has well developed nuclear programme in both military and civilian areas for socio-economic and strategic development of country. India is a nuclear state but have not signed NPT.

For civilian uses, India have three stage atomic energy programme, with objective to provide energy security, use nuclear technology in development of sectors like health and agriculture. The three stage programme include

1. Pressurized heavy water reactor which has been commercialized since 1965 and operated by NPCIL contributing 3% in energy security. Recent Kundankulam plant is the sixth nuclear power plant and negotiations are to develop more.

2. Fast Breeder Reactor , proto reactor have been constructed at Kalapakkam, Tamil nadu .



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3. Advanced heavy water reactor, it aims to utilize Thorium for energy development. A test reactor is being constructed at BARC at Trombay.

For military use, India follows no first use of nuclear weapon policy and has capable “Minimum credible deterrence” doctrine. The need for nuclear weapons arises because of hostile neighbors, for security and maintain strategic power else India believes in nuclear free world without any discrimination. In this direction India has completed its nuclear triad, capability using nuclear weapons from land, air and sea. The Indian Air force’s sukhoi-30 and Mirage-2000, land based intercontinental ballistic missiles, like Agni series, Shaurya and successful launch of K-15 missile with INS Arihant going critical India’s nuclear triad got completed

India has well defined policy and doctrine in using nuclear potentials, need to take into account the apprehensions and aspirations of people into account. AERB should be strengthened to regulate and monitor safe use of nuclear energy and the need is for a well defined civil nuclear act. Further, R&D is required to develop indigenous capability in nuclear technology.

- **What are the specific provisions contained in the environment related international instruments regarding Transfer of Technology? Discuss the tussle between developed and developing nations for TOT. (250 Words)**

Directions

First question asks specifically about provisions contained in the environment related international instruments regarding TOT

So there is specific need of mentioning them... You didn’t answer the first question. Please note down what is asked exactly.

While answering this we need to know what provisions under which international convention supports TOT directly or indirectly.... I am citing few of them here for reference.

UNFCCC Articles 4 and 11

Agenda 21: says about Environmentally Sound Technology (EST)



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Kyoto Protocol: Articles 3, 10, 11 and Clean Development Mechanism(12) that indirectly supports transfer of technology for emission reduction.

Bali Action Plan:

Doha Ministerial Declaration 2001

TRIPS: Article 7: Objective of Agreement, Articles: 8, 66 and 67 See, it is not possible to mention all articles but we should remember the most contentious one and those which are there in news particularly.

While answering the first part we need to mention atleast the broad points mentioned in all international frameworks for TOT. Then only the first part would be complete.

For second part, specific mention of developed countries abstaining from ratifying few clauses need to be emphasized. Then there is tussle over Access and Benefit Sharing under Nagoya protocol. Developed countries are trying to include countries like India, China and Brazil to the column of Developed countries so as to put constraint on their demands and utilization of resources under Developing countries norms.....Hope I am making points lucid and comprehensive to all.

- **“The lack of scientific certainty should not be a reason to postpone cost effective measures to prevent climate change”. Critically comment. (200 Words)**

To deal with any imminent problem or threat one needs to know the magnitude of the problem and also its short & long term impacts. The possible causes which led to the occurrence of any ominous situation also need to be analysed and debated because it is highly necessary to prevent the same problem from occurring again. The climate change issue presents the same difficult situation to the entire world where the possible causes are complex and scientific know how is very less on the issue but that cannot be taken as an excuse for moving away from sharing responsibilities and taking collective corrective actions. The results of the delays in taking strong actions by different governments around the world has resulted in the recent disasters around the world, which include tsunamis, earthquakes, floods etc. The changing pattern of monsoons due to change in global climate around the world has led to disruption in food supplies due to failure of crops in agriculture based economies.



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There has been a lack of will on the part of developed nations to share the burden of reducing pollution globally under “common but differentiated responsibility mechanism”, which puts an obligation on the industrialized nations to help the developing nations to achieve transition to green technologies by bearing the expensive cost of the technology. Thus in the light of the above reasoning it is the need of the hour to deal with the problem of climate change first for which may be the possible causes are not known at the moment but at least the possible solution is clear to everyone.

- **“The CBD and TRIPS embody conflicting system of rights”. Comment. (150 Words)’**

Biodiversity as defined under CBD is the basis of agriculture. It means, CBD visualize a scenario where there is healthy mix of heterogeneity in the agricultural sector.

On the other hand increased patenting under IPR will homogenize the agriculture. In that case biodiversity will be highly restricted. But there is a clause under TRIPS that states, the provision of patents and the issuing of patents should not be prejudiced to the environment.

There is one more clause in TRIPS that supports biodiversity. The best instance of the convergence of TRIPS and CBD is the initiative to protect Traditional Knowledge. Under CBD, the TK should be protected under mechanisms like...

ABS: Access and Benefit Sharing

PIC: Prior Informed Consent.....This way while commenting you need to take care of both aspects and conclude the answer on balanced level....whenever there is any statement like this, it is never right to answer as per the inferred statement....We need to deepen the associated facts with supporting arguments...Hope this synopsis would suffice the aspects needed to answer for this particular questions (Tauseef)

Note: Primary objective of TRIPS – to universalize patent protection by making it an essential element of rules based regime of WTO. It was enacted in 1995. Doha Round gave certain concessions to developing countries mainly in the domain of public health and medicine. E.g. Flexibility in right to invoke compulsory licencing. I’m not sure if it also considered patent protection related to biodiversity products.



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Primary objective of CBD – three points which i mentioned earlier. Two protocols signed under it till now – Cartagena protocol on biosafety (2003) and Nagoya Protocol on Access and Benefit Sharing(2010). It deals with patent issues related to biodiversity products and services.

An example of biopiracy would include patenting of neem, tulsi etc. by foreign companies, which in turn will divorce the local users from its usage.

How TRIPS and CBD can mutually exist?

TRIPS and CBD don't overlap except for agriculture. Even in agriculture, any novel process or product innovation, for e.g. transgenic crop by Monsanto, would come under the ambit of TRIPS whereas CBD would involve natural biodiverse products and services.

TRIPS stresses on innovation growth by protecting novelty whereas CBD stresses on equitable benefit sharing between communities.

How does CBD ensure that?

Role of National Biodiversity Authority – The NBA deals with all matters relating to requests for access by foreign individuals, institutions or companies, and transfer of results of research to any foreigner.

While granting approvals, NBA imposes conditions which secure equitable sharing of benefits arising out of the use of biological resources and associated knowledge. These benefits could include monetary gains; grant of joint ownership of Intellectual property Rights (IPRs), transfer of technology, association of Indian scientists in research and development, setting up of venture capital funds etc.

Further, NBA's approval is also required before seeking any IPR based on biological material and associated knowledge obtained from India. The NBA also has power to oppose grant of IPRs in any other country on biological resources or associated knowledge obtained or derived from India.

Role of State Biodiversity Boards – The State Biodiversity Boards (SBBs), constituted by the State Governments, deal with all matters relating to access by Indians for commercial purposes. The Indian industry is required to provide prior intimation to the concerned SBB about



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the use of biological resources. The SBB has the power to restrict any such activity which violates the objectives of conservation, sustainable use and equitable sharing of benefits.

- **“Hydrogen as a fuel offers huge potential for an energy deficient country like India”. Critically comment. (150 Words)**

The over exploitation of non renewable sources of energy resulting into non renewable destruction of environment and climate has shifted the attention of world towards clean and renewable sources.

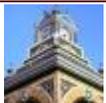
One of the most sought and researched source is hydrogen which offers huge potential along with challenges. Developing country like India, if accoutered with hydrogen as future fuel, will surely be able to lessen its thirst of energy efficiency.

Hydrogen is high in energy content per unit mass but per unit volume it is very low. Thus challenges are greater in storage for civilian purpose as compared to storage as liquid fossil fuels. It can also be used for defense vehicles and equipment, space flights etc and if worked out properly, would revolutionize the science and engineering.

The benefits of ditching fossil fuels for hydrogen are many, of course. Burning fossil fuels like coal for power generation, natural gas and hydrocarbons to run our vehicles takes a heavy toll on the environment, contributing significantly to both local problems such as elevated particulate levels and global one's such as a warming climate. The only byproduct of running a hydrogen-powered fuel cell is oxygen and a trickle of water, neither of which will cause any harm to human health or the environment.

Hydrogen can be used by mixing it with diesel or other gases and directly as in fuel cell for power generations. In recent times many research institutes and private enterprises came up with hydrogen powered vehicles. Banaras Hindu University along with IIT's are particularly doing research in this field and come up with different way of producing and storing hydrogen but seems far from cost effective measures and affordability.

Hydrogen is an energy carrier rather than an energy source. While hydrogen always exists in conjunction with other elements such as water, it must be separated for individual use. Moreover it is a gas and for its usage, the convertibility in the liquid is a major challenge along with cost effective measures.



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Indian status of research narrates a dismal figure because of its infancy and lesser research and development in this field. It is estimated that the country would be able to produce 3,50,000 to 4,00,000 MW of power by 2030 if it uses hydrogen in electricity generation as overcoming the power deficit is one of the major challenges that the country is facing along with poverty, and providing education and water supply.

- **“Doping remains greatest threat to sports integrity.” Comment on the statement explaining various forms of doping. (200 Words)**

Doping in layman terms means adding something externally. In sports fraternity it means taking those things which are banned by WADA.

These do-pants can be things like drugs, steroids, stimulants etc. They can be taken directly in blood or in the form of pills or can be inhaled.

Now why this is happening? It's purely because of lack of SPORTSMANSHIP. Earlier winning or losing was not that important but it was the spirit with which the game was played mattered. But a person is mirror of its society and acts according to the values and systems of society. Today values has changed, we see people saying “WINNING IS WHAT ONLY MATTERS” “End is more important than means”. So even in sports winning matters attitude has shown its effect and degraded its original charm and hence acting as enemy for its own motto Citius, Altius, Fortius

Doping can be of any of the following types: Performance enhancing drugs – Stimulants, Steroids, Diuretics and blood doping agents etc. (Raj)

- **Compare and contrast Cloud computing and Grid computing? What are the issues involved with them? (200 Words)**

Cloud computing encompasses any subscription-based or pay-per-use service that, in real time over the Internet, extends IT's existing capabilities.

The grid computing concept isn't a new one. It's a special kind of distributed computing. In distributed computing, different computers within the same network share one or more



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resources. In the ideal grid computing system, every resource is shared, turning a computer network into a powerful supercomputer. With the right user interface, accessing a grid computing system would look no different than accessing a local machine's resources

Cloud computing involves issues like as Security, bandwidth, performance issues, Data issues, energy issues and even grid computing is also facing same issues like security, hardware issues, because since the cloud and grid computing are interconnected globally these issues must be address before making it successful (Kiran g)

- **What is the significance of Helium-3? How it is related to the quest for lunar missions? (100 Words)**

Helium -3 is a light and non radioactive isotope of helium which is rare on earth and is most sought for use in the nuclear fusion research.

The nuclear fusion reaction leads to significant energy loss and are extremely difficult to contain. One potential solution may be the use of He-3 as the product is stable Helium and huge energy, which can be easily contained.

He-3 is rarely found on Earth and is released by Sun in tremendous amount. Due to earth's atmosphere it scarcely reaches on surface. Since Moon do not have an atmosphere, it is absorbed by lunar surfaces adequately.

The Russian Space Corporation was reported planning to mine lunar He-3 with a permanent base there very soon. The Americans through NASA have announced its intention to establish a permanent base by 2024 and He-3 is betokened as one of the potential reasons. China too, plans to put such initiative by 2017.

India already completed Chandrayan-1 and planning for Chandrayan-2 very soon. Recently DRDO officers envisaged their efforts to find out ways to bring He-3 to realize our energy needs.

Thus under the aegis of lunar missions nations are in the race to fulfill their energy need and bring back one of the most reliable source for nuclear energy i.e Helium-3. (Tauseef)



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- “The Biotechnology Regulatory Authority Bill, 2013, if passed, will adversely affect agriculture, health of humans and animals, and the environment, causing unparalleled harm”. Critically examine. (200 Words)

India’s Agriculture is seen as stagnating, thus demands a second green revolution. This demand is seen synonymous to inclusion of Genetically Modified Crops. But many case studies from around the globe , reveal the health and environmental concerns which follow Bio-Technology. So in order to cater the demands as well as promoting their safe use, the Government has brought a new Biotechnology Regulatory Authority Bill, 2013.

The Bill provides for a Bio-Technology Regulatory Authority to regulate the use of Bio-Technology. A committee constituting five scientists will be given charge. This is being seen as a major conflict of interest. The Ministry of Science and Technology, which promotes use and inclusion of Bio-Technology, will regulate its use also. Plus its functioning will be out of RTI.

The resultant framework will also breach federalism. Agriculture is a state subject and this bill gives Union the power to regulate and intervene. The 73rd and 74th amendments seek the gradual devolution of power to local governments (PRI’s). Agriculture should be foremost function controlled by them, but this bill denies this provision of constitution.

Apart from these fundamental and constitutional neglects, the bill does not empower either the Health Ministry or the Environment Ministry to intervene or monitor the use of Bt crops.

Hence such bill will adversely affect agriculture, health and environment owing to draconian powers it confers to the body which is the nodal agency to promote Bio-technology itself.9India’s Agriculture is seen as stagnating, thus demands a second green revolution. This demand is seen synonymous to inclusion of Genetically Modified Crops. But many case studies from around the globe , reveal the health and environmental concerns which follow Bio-Technology. So in order to cater the demands as well as promoting their safe use, the Government has brought a new Biotechnology Regulatory Authority Bill, 2013.

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Hence such bill will adversely affect agriculture, health and environment owing to draconian powers it confers to the body which is the nodal agency to promote Bio-technology itself. (Vicky)

- “India should act proactively to protect its high standard Patent regime”. Comment in the light of recent happenings and Supreme Court verdicts. (250 Words)

India, a nation with a genuine interest in public welfare has a rational patent regime. Even though it is portrayed to be a country with strict patent laws, it is a fact that it has given more than 4000 patents in a span of 6 years. That too, most of them to elite multinational drug companies.

India has maintained its high standards in the IPR issues, by granting only legitimate innovations as patents and by rejecting cheap profit-making tricks of large MNCs. The best example to cite is the recent landmark decision of the Supreme Court in rejecting Novartis' anti-cancer drug, Glivec. Glivec, was just an incremental change over its predecessor, and Novartis wanted to patent this to retain its production rights. This process of evergreening was rejected outrightly in a fair and transparent judicial process

If Glivec was granted its patent, it would be out of reach due to its high costs. With a largely poor population in India, the patients needed cheaper drugs which were being produced by other companies. By granting that patent, it would harm the entire society in getting health facilities.



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MNCs' sole motive is profit-making, it would even undergo unethical business tactics to retain their profit motive. This is highlighted by the company Warner-Chilcott, where it stopped the production of a drug just because its patent protection was over, affecting hundreds of patients. These practices should be regulated well, which the Indian patent regime is doing outstandingly. It should continue acting proactively to curb such malpractices and ensure protection to its citizens. (Akand Sitra)

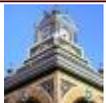
- Discuss the salient features of New Science, Technology and Innovation policy, 2013? (250 Words)

India has a huge young people whose energy and potential can be converted into demographic dividend by enhancing their capacity building using science and technology. Thus a new science technology and innovation policy is initiated in 2013 with purpose of faster , inclusive and continuous development of society.

STI policy aims at spreading scientific temper among all sections of society by encouraging use of science based applications. It targets at making research and development career oriented so that more young ,talented and bright minds are attracted in this field.it envisages making india a global scientific power in selected areas of science. And bringing about india in top five world science leaders by 2020.

For these initiatives heavy investment in R&d is needed which would be provided in the coming decade (2013-2023) up to 2 per cent of GDP. Innovation coming as output will be tapped by establishing innovation based businesses. Private participation has also been encouraged in policy to invest in R&D field. This new STI policy is going to establish strong innovation system across the country.

However , despite great vision of STI policy fundamental need is to overhauling our educational system.scientific temper starts at school level but poor school scientific infrastructure and poor capacity of teachers with regard to scientific education are needed to be addressed. Our very poor scientific and technical educational qualities particularly at private engineering colleges is demanding immediate attention.



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STI policy is the much needed policy and its effective and efficient implementation will produce the desired results as envisioned into for scientific development and nation building.(Vinod)

- Describe the achievements of ISRO in the last few years. What are the challenges for India in Space research technology?(250 Words)

ISRO (Indian space research organization) is amongst the six largest government space agencies in the world. ISRO has achieved numerous milestones since its establishment. India's first satellite, Aryabhata, was built by ISRO and launched by the Soviet Union in 1975. Rohini, the first satellite to be placed in orbit by an Indian-made launch vehicle, SLV-3, was launched in 1980.

Isro has done a commendable job in the last few years the successful execution of Chandrayana 1 proved isro ability in the field of space. And the successful development of PSLV (Polar satellite launch vehicle) also proved the isro ability of developing the launch vehicle by its own. Recently isro completed its 100th launch of two Japan satellite by PSLVC21. Indian National Satellite (INSAT) System. The INSAT series, commissioned in 1983, has today become one of the largest domestic satellites systems in the Asia-Pacific region comprising ten satellites in service.

Isro is facing a lot of challenging of developing of his own vehicle GSLV(Geo synchronous launch vehicle) to lift off heavy satellite upto 4 tonne and sending of astronauts into space by 2016 are the challenges isro is facing today and the budget which is allotted to space must also increase since the neighbor country like china are spending a lot of money on the space on increase their presence. India must focus on these issues to make their presence in the space industry(Kiran g)

- What are Bitcoins? Why government is critical of its working? 100 words

Bitcoin is an alternative form for currency which exists on the world wide web. This digital currency doesn't need any governmental authority for mediation and the transactions are fully secure. It is fully decentralised to address the shortcomings of internet commerce and removes additional processing transaction costs.



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issues. The transactions are also anonymous so this could breed a ground for illegal money laundering and terrorist activities. Hence, the usage of bitcoins should be transparent and must make the customers not anonymous for global safety.(Akand Sitra)

What is Quantum cryptography? Why it was in news recently? **100 words**

Quantum cryptography uses our current knowledge of physics to develop a cryptosystem that is not able to be defeated – that is, one that is completely secure against being compromised without knowledge of the sender or the receiver of the messages. Quantum cryptography is different from traditional cryptographic systems in that it relies more on physics, rather than mathematics, as a key aspect of its security mode

With the revelations that the National Security Agency is snooping in everyone's data, it's no surprise that some institutions would want to protect it with something that is spy-proof, and with unbreakable encryption as well.

Quantum encryption is so powerful because it's impossible to listen in on the data without corrupting it. Quantum bits can't be copied, so any attempt to listen in changes them and alerts the people communicating that something is up. So every organization is moving up to quantum technology to be more secure (Kiran g)

- What are designer babies? Describe the various issues associated with it? **100 words**

With the usage of advanced genetic technology to modify the embryos and choose the desired characteristics stands for designer babies. The term coined by journalists, not the scientists. It uses In vitro fertilisation technology i.e fertilising the egg with sperm in laboratory has exclusive feature to combat the genetic disorder.

On the positive side, by using the pre-implantation genetic diagnosis, one can screen the embryos and the healthy ones can be implanted in mother womb. Further, using the germ line therapy, by replacing the faulty DNA with healthy DNA prevents genetic disorders



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On the other side, with the available options always parents want their kids to be at best. Hence, this technology may be misutilised for personal benefits and turns like a manufacturing a product with required features. (Caabhinesh)

- “Powerful Science communication is an asset to the transformation of societies”. Examine. (200 Words)

Communication driven by modern technology and scientific laws has continued to substantiate its indispensability in transforming the society. Different sectors of communication have developed.

When cyber communication provides for real time exchange of ideas and services; mobile communication provides for quick mode of tele communication. It has also been used a tool for access to critical government facilities. Various schemes were enacted by government to deliver public services through internet and mobile based platform. This not only decreases the red tape and corruption but also the in home access. Further information about the climate and agriculture commodities like fertilizers, soil profile can be provided to farmers through mobiles.

Moreover internet has created a new political socialization, economic prosperity and financial inclusion to large sections of society. Concerns remain about the privacy and snooping can be dealt with more powerful communication like Quantum cryptography.

Satellite communication provides tele-medicine, tele-education to hitherto inaccessible areas thus transforming the life of people and increasing their standard of living. Explorations abroad provide insightful data about the origin and evolution of universe to better development of strategies and program of climate change as well as innovations. (Sahil garg)

Note:

Sahil good answer as usual Anyways answer seems more urban centric ! shudnt points relating to elimination of superstitions that has led to exploitation of poor , death of activists like Dabholkar be mentioned ! i mean they are basic scientific principles which would help incorporate a greater rural mass into development ? Science is not just utilitarian aspect but also outlook to things ? (RV)



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Answer is well structured and lucid but i feel there are some point which could have been replaced by more needed stuff like, bharatiya brodband project (which aims at connecting all the panchyats) ,CCTNS (aims at connecting all the police stations in India) these points would have shown India's stand as well as the positive aspects of communication technology the unnecessary(though they are not misplaced or out of context)points which i feel are about privacy and last three lines(they show more that communication is a boon rather than an inovated asset) (Neurotoxin)

- “India needs to speed up the indigenization process of its defense production in order to root out corruption from the sector”. Comment (200 Words)

Corruption is a social evil that has even haunted defense production and jeopardized national security. Scams such as bofors, MIG, VVIP copper deal led to demands for indigenization of defense production to stop corruption by insulating it from kickbacks, lobbying as well as discretion based procurement process.

However indigenization is not a panacea for corruption in defense sector. Proponents argue that technology transfer, co-production, co-development can provide a major bulwark against defense production. But this process cannot guarantee corruption free defense. Further, it will shift corruption from international level to national level

The aforesaid reasons may be due to interference from bureaucracy and various government machinery coupled with long delays in starting project, red tape. There have been long delays in indigenous defense production due to problem in starting the project, getting clearances which can provide thriving ground for production.

The need of the hour is transparent, competitive bidding process which has been launched in the form of Defense Procurement Policy. It provides for production and procurement of defense equipments, letter of intent in an objective, impartial manner with better scrutinized rules.

Therefore it is necessary in the interest of national security and development of India as one of the world power to insulate its defense sector and equipments from corruption.(Sahil Garg)



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2. Surging of scams in various defence requirements related issues, like VVIP choppers deal, Bofors scams, MIG, etc have caused several doubts over the functioning of defence sector. It can have devastating effects not only on national security but it also hurts patriotic sentiments of soldiers of the country as well.

The root of corruption in defence sector lies chiefly into lacking indigenization of defence production process. Due to lack of indigenization of defense production process, India has no option but to buy defense requirements from abroad massively and such deals are lengthy and complex in nature. More importantly, such sensitive deals contain domestic players as well as a number of powerful international stakeholders, who lobby considerably to influence such deals towards their suited best interests. Defense equipment deals stapled with huge budgets are done into international domains with also taking account into world diplomacy, geo-political scenario and international laws, which further act as fuel to fire regarding rooting corruption in defense sector. The domestic-international stakeholders nexus does the every possible endeavour to take advantage from such supplies and by using their influencing powers, make it almost impossible for probe agencies to hold the original falters. Thus, corruption takes catastrophic effect over defense activities.

though, only indigenization of production will not help to uproot the corruption from defence sector completely, but since in defence sector buying defence requirements is among the major activities, therefore it will drag it to a lesser extent. Indigenization of production process coupled with a strong nationalist willpower is always necessary to uproot the corruption from the defence sector. (Biman Ghosh)

- What is the link between HIV and TB? Give your views on government's efforts in TB eradication and what are challenges for India? (200 Words)

HIV weakens the immune system in human body. A person with HIV is more prone to be developing TB disease than a non-HIV person. Similarly TB speeds up the process of converting HIV into AIDS and shortens the life span of HIV suffering person. Both the diseases in conjunction can easily turn into an epidemic.

TB is one of the leading causes of deaths in India. TB is an infectious disease that spreads through air. A single patient can affect several other people. TB not only prevents the social & economic development of people suffering from it but also puts a lot of financial burden on the people & their family.



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India government launched Revised National TB program in 1992 based on DOTS strategy. Program has been a huge success and it has been able to cover whole of India. Since the inception of program several health workers have been trained and diagnostic laboratories have been established across the country for early detection & cure of the disease.

Poor primary health care infrastructure and inadequate diagnostic center along with poverty, unregulated private health care are some of the biggest challenges in India fight against the TB eradication. Improper initial care for TB patient can develop in to Multi drug resistant TB. India already has shortage of (MDR) TB doses & diagnostic center that has become a nightmare for Indian government (Vipul)

- “True polio eradication is nothing but zero incidence of polio virus infection”. Justify the statement based on India’s performance and suggest measures for improvements. (200 Words)

India has been declared a Polio free nation as per the WHO definition that considers only absence of wild type infections to evaluate the polio free nation. But in recent time, there have been instances when vaccine derived polio cases have been reported in the country.

Polio vaccine work on logic that children are orally given weak polio virus in form of drops that improve the immune system against the Polio virus for a limited period. After a limited period virus is excreted that can spread in to immediate community. If the community is not properly immunized then it weak virus can go through genetic changes and take the form of Polio virus. Though the virus given is very weak but it still has scope to develop in to polio disease especially in the population with poor immune system. VDP cases generally take longer time to occur. Vaccine derived Polio virus incidences are much lesser but if left unchecked they can pale the efforts of Indian government in polio eradication. Regular immunization program especially in the vulnerable section is very critical to control the VDPVs cases.

- Emerging technologies bring with them new ethical and regulatory challenges.” Comment. (200 Words)

Technological advancement are necessary for the development of a country. Innovation or speedy adoption of new technologies have been the one of differentiating factor between the developed and less developed countries..



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Technological advances such as Internet has emerged as an effective tool in hand of people to get access to wide range of information, for government to deliver quality service to the people. Social media has become medium for the government to indulge in two way communication with people in forming out its policies and programs. But along with this, ICT development has created issues such as Internet defamation, piracy, copy right infringement, spreading rumors etc. Similarly advancement in DNA engineering has helped the society to diagnose any serious disease well in advance. At the same time, concept of designer babies have opened up ethical conflicts across the world. Genetically modified seeds promise to support the much needed agri productivity improvement but at the same time put in risk the biological diversity

India science & technologies policy proposes to use the technologies for sustainable & inclusive development of country. Technological advancement are double edges sword .It is necessary to draft ethical and legislative guidelines for technology users so that technologies are used for the benefits of society & environment and not harm it.

- “Critically analyze the salient features of the Mental Health Care Bill 2012? (200 Words)

India has introduced the Mental health care bill to recognize the right of patients with mental access and improve the access to mental health care. Bill recognizes the right of person with mental illness to get affordable healthcare service in government run or funded facilities. Bill also recognizes that patients do not suffer from inhuman & degrading treatment and seeks to provide them access to health records & legal councils. Bill appears right in its intention but fails to address the issues of shortage of mental healthcare infrastructure in the country.

Bill recognizes that patient can give an advance directive on how he should treated in case of any illness. Such directive should be approved by medical practitioner or health care board. If guardian or relative of patient does not want to follow the directive then they should make an application to healthcare board that will decide on the basis of merit of case whether to bypass the advance directive or not. Concept of Individual freedom is different in India. Family and relationships plays an important role in our society. Concept of advance directive will create the gap between patients & family that is at times the only support for the patient. Role of society in handling mental health care cases has been neglected.



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There was an urgent need to update and address psychological and mental problems in patients, after India ratified the UN Convention on the Rights of Persons with Disabilities(UNCRPD) in 2008. This made the government to come up with a Mental Health Care Bill in 2012, in an astonishingly short time. It is now realized that it needed a lot more discussion and debate before it could become a law.

Even though the Bill has some path-breaking achievements in cases like defining the mental illnesses appropriately, giving the power of decisions to the patients themselves, having a rights-based protection against mental illness, increasing the duties of the government in awareness, sensitizing people with various other programs, a change in the system by having new organizations etc., it still needs to address further issues.

With the setting up of review commissions, review boards and health authorities, the Bill should also have set up a Regulator. Ethical problems in treatments always come up, and these should have been addressed properly. For example, if a patient doesn't want a particular treatment but the doctor knows that it would immensely benefit the patient, the conflict of interests should have been solved in an amicable way which the Bill failed to address. It also failed to mention the importance of counselors, psychiatrists etc., who are mandatory in mental illness issues.

Thus, even though the MHCB 2012 is an excellent improvement on its predecessor, it could have been improved a lot further.

3. What is cDNA? Why it was source of concerns in recent times? (100 Words)

Complementary DNA is that part of the whole DNA which doesn't include the non-coding regions, that is the junk DNA is removed. It can be used in gene cloning, to express required proteins or to make a cDNA library. It was in the news recently as an US court had ruled that original organic DNA of organisms cannot be patented as it is a natural product, but the cDNA can be. This means that, after the original DNA is processed to remove all the introns by gene splicing, it becomes patentable by companies which can be used for profit.

1. What is Minamata Convention? Discuss on the backdrop of the related disaster.(150 Words)



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Exposure to high concentration of mercury can lead to mercury poisoning under which people lose sensation in their hands & feet. Exposed people suffer from difficulty in seeing, speaking hearing etc. Poisoning may even lead to the death. During 1930s, chemical plant in Minamata started releasing mercury compound in the ocean water that affected the fish population around the areas. Contaminated fish consumption led to mercury poisoning among the thousands of population in Japan

Minamata convention is a UN driven convention to limit the use of mercury and its emissions internationally. At present mercury is used in range of industries such as coal based plants, bulbs, medical equipment, soap & cosmetics, mining, vaccines etc. Convention proposed to ban/limit the use of mercury in several industries in phased manner while some of industries such as soap, vaccines etc. are exempted due to the absence of substitute or net positive benefits. Nations ratifying the convention will first have to pass the domestic laws to control the mercury use.

- What is the difference between TFR and NFR? (100 Words)

Total fertility rate –Expected number of children to be born to a woman during her reproductive period. TFR can be helpful to project the population change in a region over a course of time. TFR for India is 2.4

NFR(Net fertility rates)-Expected number of girl child to be born to a woman during her reproductive period. NFR is not widely used but it could be relevant for the countries like India which have child sex ratio skewed in favor of boys due to socio cultural issues(Vipul)

- What is Cable TV Digitization? Discuss its implications on consumers, industry and Government. (150 Words)

Cable TV Digitisation, is a pan-India scheme to change the analog television customers to a digital system. This would enhance the quality and variety of programs to the customers. Instead of watching about 100 channels, a customer would now get to watch about 500 channels for the same price.

This also benefits the advertisers as there would be a transparent system in knowing the number of subscribers. This would help them in targeting specific areas and make a niche genre



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more profitable. Underreporting of the number of household numbers has been a major issue, and such digitization would fill in all loopholes, thus enhancing the revenue of the exchequer.

Thus, with a higher number of channels, the viewership would increase hereby increasing advertising budget and governmental revenue. Thus, cable TV digitization is a win-win policy for everyone. We just need to make sure that the implementation is smooth as it is a humongous task.

Television revolution started in India in 1980s since then India has witnessed several innovations in the sectors. India currently has nearly 150 million Television viewers. TV viewership in India use one of the methods: Analog cables services, Digital cable services, DTH services. Almost for 2 decades, cable operators used to provide channel subscription to the Television viewers through analog cables. Analog cables limits the channel availability and scope of providing value added services. GOI has enacted a law to digitize the Cable TV connections in phased manner by the end of year 2014. People will have to install Setup box or move to DTH services to align with the law.

Digital connection will definitely benefits the consumers in terms of picture, sound quality, availability of channels, uninterrupted connectivity, internet ,values added services etc. Industry especially D2H service providers will benefit the most as all the users will have to switch to digitization in next few years. HD televisions and Setup box manufacturers will gain in the process. Industry players can provide VAS that will boost their revenue. Local cable operators who fails to adopt the Digital technology may lose out during the change. Once the cable industry goes digitized, government will have more transparency in cable connections. Government revenue from the Tax will also go up.

- What is WIFS program of Union health Ministry? What are its benefits? (150 Words)

At least 55 per cent adolescent boys and girls under nineteen suffer from anemia, keeping this in view Ministry of Health launched a Weakly Iron and folic acid supplementation programme.

It will cover the school going children from 6th to 12th class in government run schools and out of school adolescent girls via anganwadi platform. It will implemented in both rural and



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urban areas and will cover around 13 crore beneficiaries. Which will be helpful in addressing high prevalence of anemia

Apart from distributing Iron supplements it also have provisions for monitoring referral of severe cases to health center and awareness generation about healthy diet to cover up sufficiency. Its benefits are many, it will help to reduce anemia and many anemia related diseases like weakness, less memory power, underweight etc.

In girls specially in the long run it will help to reduce MMR, IMR, still birth cases. Because healthy mother can only give birth to healthy child. As it will generate awareness it will help to family members of beneficiaries also. And referral will help to proper treatment at proper time. Its a very good programme and should be implemented effectively and should be extended to private schools also.

World-wide, more than 2 Billion people suffer from anemia. India has the largest population of people suffering from Anemia. Anemia is caused by the deficiency of Iron in body. Iron is necessary for hemoglobin and brain development. Iron deficiency can negatively impact the development of immune system. Anemia affected adolescent girls are also more susceptible to be victim of maternal mortality or child death during birth.

Incidences of nutritional intake deficiency are very prevalent in India especially in the age group 15-19. Recognizing all this, Union health ministry has launched the weekly iron and folic acid supplementation program to control the Anemia. Program has been launched for school going adolescent girls and boys in urban & rural areas. Program will be implemented through government run schools, Aganwadi centers etc.

- What is Robo-bee? Explain its applications. (150 Words)

Robo-bee is a tiny flying robot based on the biology of bee being developed by harward university reserchers team. It has various applicaitons in autonomously poolination of fields of crop, search and rescue operations in disaster timing, hazaroud environment explorations, military surevelliance, high resolution weather and climate mapping and traffic monitoring.

- What is Biobank? What are the ethical concerns involved in establishing Biobanks? (150 Words)



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Bio-banks are the repositories of samples of Human organisms such as blood, plasma, saliva, DNA etc. Bio-banks also have the information such as ethnicity, gender, blood group etc. along with the genetic information. Research bodies use such different samples to carry out their research and development program. Intention of bio-bank is to identify the accurate cure for a particular disease after doing the trial on similar kind of genes.

Ethical concerns

Most of the bio-bank collect the information without the acknowledgement of the donors. People turning up for the clinical trials are used for collecting the bio-bank resources, sometimes without their knowledge. Genetic information belongs to the people, which can be put to some other use than the clinical research without donors knowledge. Currently there is no mechanism as such to share the benefits of clinical trials on genetic information, with the donors.

- Why Bedaquiline was in news recently? (100 Words)

Bedaquiline is a drug that is used for multi drug resistance TB. Multi drug resistance TB develops when bacteria become resistant to commonly used drugs.

Bedaquiline should only be used when the traditional drugs have failed to improve the resistance against disease and doctors should refer to the patient's previous TB history and local TB drug resistance data before prescribing the use of drug. India does not have a regulatory environment to control the misuse of such drugs by the doctors. Indiscriminate & excess use of Bedaquiline can result in development of bacteria resistance against this drug as well.

- Discuss the role of silver Nanoparticles in water purification? (100 Words)

Team led by IIT-Madras professor has identified that silver Nanoparticles can be used as an effective and cheaper way of cleaning water. This way of cleaning water does not require the electricity supply or hydrostatic pressure, techniques used in traditional water purifiers. This technology is based on release of about sustained amount of silver ions in large volume of water to kill the microorganisms

As silver ions in more amount can destroy the cell membrane and damage DNA, it is necessary to go for sustained use of silver ions, for which team used the composite of



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aluminum hydroxide on which silver nano-particles are deposited. Nano particles deposited on composite interact with water and release the silver Ions to purify the water.

Composite may suffer from scaling after prolonged used .Reactivation of silver ion can be achieved by heating the composite and Consumer can use such filter for long duration of 5-6 years.(vipul)

- What is the New National Antibiotic Policy? How far this policy will curb the menace of increasing antibiotic resistance? (150 Words)

Antibiotic resistance has become a major public health issues in the country. As per government figures, 20-50 % of anti-biotic use in the country is inappropriate. For ex-Some chronic diseases such as TB , already drug resistance is becoming a more critical issues than the disease itself.

National anti-biotic policy was framed to address the problem of multi drug resistant due to widespread and discriminate use of anti-biotic drugs. Antibiotic policy was designed to monitor the manufacturing and use of anti-biotic drugs and also proposed to develop a surveillance system to monitor the anti-biotic resistance in the country. Policy has recommended the complete ban on over the counter sell of the antibiotic drugs. It was shelved due to widespread protest against key recommendation.

New policy has been drafted to make the policy implementable. Initially selected list of antibiotics will be put on the restriction in counter sells and additional drugs can be added in phased manner. New policy has also highlighted for the need of representation from different system and private hospital in the surveillance system. Urgent implementation of the Policy is the need of the hour as incidences of drug resistance has increase since the first time policy was drafted. Otherwise its social and economic cost will be too high for the country to bear.

- What is Bio-terrorism? Explain with examples (150 Words)

Bio terrorism involves intentional dissemination of biological agents. It is a criminal act against the civilians by using the biological warfare agents. These agents are colourless , odourless micro-organism (Bacteria,virus,fungi) or toxins derived from the micro organisms which can be spread in to the air as aerosols or in water or in food to affect as many as



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people. These agents are in many types such as lethal (Bacillus anthracis, small pox virus etc), incapacitating agents (Mycoplasma fermentus).

These agents are easily concealed and difficult to detect before an attack. Bio terrorism need not necessarily to have immediate death among the civilians. The main advantage to terrorists is creating a panic, chaos among the civilians in mean time they can easily escape. Further to this, every biological warfare agent has its own incubation period of several days to cause sickness, hence this time would allow on the terrorist to perform undetected acts and escape in mean time.

The recent outbreaks of inhalation of anthrax in Florida and New York in 2001, is an example of fairly restricted a bio terror attack. In this case, modest amount of anthrax spores caused only few casualties and one death but created tremendous panic among the people.

1.

- What is cultural Eutrophication? Discuss its effects on species diversity. (150 Words)

Eutrophication is the process that increases the rate of supply of nutrients to the water bodies. Nutrients supply may increase due to natural reasons or human activities. Human led eutrophication is called the cultural Eutrophication

Due to human activities such as clearing of land and building of cities, land runoff increases that subsequently supplies the excess amount of phosphates and nitrate etc. from land to lake & rivers or other water bodies. Excess nutrients result in the development of algal bloom in water bodies. Excess of algal bloom reduce the dissolved oxygen in water bodies that cause the death of other water species such as fishes etc. Cultural Eutrophication negatively affect the population of certain species in water bodies and subsequently the complete food web chain is impacted.

- Describe different types of Water Footprints? How it is measured. (150 Words)

Freshwater is a scarce resource and its availability is impacted by the human consumption as well as human caused pollution. Common people can easily identify the source of direct use the freshwater. But they often fail to visualize the use of water to manufacture the good & services consumed by them. In today world of globalization where good & services cross the



borders frequently, it is necessary to calculate the water use across the supply chain of good & products.

Water footprint is an amount of fresh water used directly or indirectly by the consumers or producers. Water footprint can be split in to 3 categories. Blue water footprint is the volume of surface water and ground water by an entity. Green water foot print correspond to rainwater consumed while the Grey water footprint is the amount of freshwater that is required to assimilate the pollutants discharged by an entity and to maintain the standard water quality. Water front can be calculated for an individual, products, process, business, community or a nation.(vipul)

2. A water footprint divides the water into three different types – green, blue and grey. Green water represents the natural water cycle – the water evaporated by trees. Blue water refers to water withdrawn from rivers, lakes and aquifers and which is after usage in the production process not led back to the same watercourse. Grey water presents the amount of water needed to assimilate the remaining pollutants after the waste water cleaning process so that the water quality is equal or close to the natural status.

The source of water is split into categories such as: natural rainfall over agricultural lands, and water taken from rivers, lakes and groundwater resources. Agricultural activities that capture rain, such as on farm dams, can also be important. The impact of using this water is considered in the context of local water scarcity and expressed in an equivalent unit of water, H₂O_e ('e' stands for 'equivalent'). Another agency Water Footprint Network launches innovative online tool to drive sustainable water use The WFA Tool 1.0 is free and can be used by anyone interested in sustainable, efficient and fair water use, including businesses, governments, NGOs, investors, researchers and communities.

- What is Earth's Overshoot Day? (100 Words)

Earth overshoot day was celebrated on Aug 20 2013 when the entire human kind exceeded the nature resources budget of the year 2013. From this day forward, the planet will be operating under an ecological deficit, using more resources than the planet can produce and emitting more carbon dioxide. Earth Overshoot Day, a concept originally developed by Global Footprint Network partner and U.K. think tank. Earth Overshoot Day is an estimate, not an exact



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date. It's not possible to determine with 100 percent accuracy the day we bust our ecological budget.

- “Ecological Deficit is much more alarming than Fiscal deficit”. Comment (200 Words)

An economic deficit in simple terms is defined as the excess of expenditure over revenue. If this is continued, it would diminish our economic resources as we have to keep spending on our expenditure without getting the required money back.

In the same way, an ecological deficit refers to the usage of natural resources without keeping the sustainability in mind. In a way, we are reducing the earth's capacity to renew itself thus inhibiting our own future consumption.

A fiscal deficit merely makes us go through a hard economic phase with a lot of reduction on our lifestyle, but an ecological deficit in the long term might result in the extinction of the planet itself thus annihilating all lifeforms forever. We are already in the process as we can see a change in the climate, many species on the verge of extinction, the thinning of ozone layer, higher frequency of natural disasters like cyclones, famines etc. Such side effects of an ecological deficit will obviously cause a fiscal deficit as each disaster is followed by destruction and huge money goes into rehabilitation process

Thus, we need to ensure that human activities which affect the environment drastically should be reduced further for our own benefit. Economic development may be important right now, but money without survival doesn't make sense.(Akand Sitra)

As the country moves on path of economic development, its demand for natural resources such as land, water, energy resources etc also increases. Study of Ecological footprints provides a great deal of information about the sustainable development. Ecological foot print is the amount of natural resources which are required to produce the goods & services consumed by an individual/community/nation.

Ecological deficit for a country is a situation when the country consumes more natural resources than the nature's ability to regenerate it. India is expected to be the largest populated country in coming years. India will have to use more land, water & fertilizer to feed such large population. To meet the energy demand of such large population, we will have to extract more



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coal or other energy resources from the earth. Majority of India population will be residing in urban areas and Consumption of natural resource will further increase in wake of changing life styles.

- In layman's terms differentiate between El Nino and El Nino Modoki?(100 Words)

El Niño Modoki is a coupled ocean-atmosphere phenomenon in the tropical Pacific. El Niño Modoki is associated with strong warming in the central tropical Pacific and cooling in the eastern and western tropical Pacific.

El Nino, an abnormal warming of surface ocean waters in the eastern tropical Pacific, called as Southern Oscillation. The Southern Oscillation is the see-saw pattern of reversing surface air pressure between the eastern and western tropical Pacific; when the surface pressure is high in the eastern tropical Pacific it is low in the western tropical Pacific.

- Differentiate between Bio-accumulation, Bio-concentration and Bio-magnification with examples. (150 Words)

Bio-accumulation-Bioaccumulation occurs in a same trophic level. Bio-accumulation results in accumulation of a particular substance (pollutants) in the organism bodies. Bio-accumulation may happen due to present of pollutant in lower trophic level organism or through the environment. For ex: Fish found in contaminated waters can build up pollutants in their tissues.

Bio-magnification-occurs when the concentration of a substance increases across the food chain. Organisms at high trophic level generally eats more number of organism at lower level. If a pollutant has entered in to a lower level of food chain then its concentration will magnify when it move up the food chain. Bio magnification occurs across the food chain. For ex: Shark fishes who eats lot of smaller fishes may develop high concentration of pollutants in their bodies if the smaller fishes are contaminated.

Bio-concentration-Bio-concentration occurs when amount of substance in an organism exceeds the substance available in surrounding environment. Term is generally used with reference to aquatic environment and organisms. For ex: Oil spill in sea will result in concentration of Oil in fish tissues more than what is found in surrounding environment.



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- Marine pollution is multi dimensional”. Comment on the efforts of government to tackle the problem. (200 Words)

Marine environment consists of coastal areas, mangroves, coral reefs etc. Marine pollution can occur when the mangroves are encroached upon by the human settlement or coral reef dies due to anthropogenic activities or pollutants/harmful substance enters the ocean water directly or indirectly and negatively impact the living species in ocean, ocean environment or quality of sea water. Marine pollution not only impacts the ocean ecosystem but it also impact the human health as we intake fishes and other sea faunas as food. Marine pollution can occur due to range of factors such as discharge of sewage, toxic, chemical pesticides, radioactive waste thermal pollution or Eutrophication etc. Each Sources of marine pollution (agriculture,urban waste,river run off, industrial waste etc.) is very different and require an individual approach to handle it.

Government of India has enacted several laws to protect the marine environment. Under the water (prevention and control of pollution) act, state pollution control board have been established to control the discharge of untreated industrial or other wastes in to marine environment. Wild life protection act has been amended to protect the marine species as well. Coastal regulation zone notification was implemented to regulate the activities in coastal areas. Act divides the coastal areas in four zones and lays the guideline of kind of activities which are permitted and prohibited in these Zones. Some of the marine ecologically sensitive areas have been declared as the Marine parks for ex: Gulf of Mannar. Government has also launched Coastal monitoring and prediction system program to study the effect of human activities on marine environment.

- Describe the “Ethanol Blending” program of India with reference to current economic situation? (200 Words)

The economy is facing the issue of twin deficits. Oil subsidy is the one, which impacts these two. Ethanol blending is a program started o reduced this subsidy.

Government has decided mandatory blending of 5% of ethanol in disiel and petrol. This is very less in comparison with other emerging economies. Brazil made it 20%. There is a need



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to increase this, which partly helps government in limiting subsidy to 2% of GDP in election year.

India is not self-sufficient in Ethanol production. The bagasse, the by product of Sugar factories are used to make it. The beverage companies are currently offering more price and consuming all the bagasse. In these circumstances, Ethanol production from other abundant resources like wheat waste, grass can be pursued. The technologies are not available with Indian companies, need to be acquired from companies like Brazil. As per the estimates, the acquisition cost will be below the benefits acquired through blending.

Hence, modernizing , diversifying ethanol production, thus becoming self-sufficient will help India in controlling imports of crude.

- “Bio-fuel sector in India is undergoing a dramatic change, and it calls for efforts to generate necessary human resources to tap the emerging opportunities”. Evaluate (200 Words)

Answers

India has announced Bio fuel policy in 2008 aiming to increase the bio fuel market share to 20%. However, there are many constraints, challenges in this regard

Bio fuel is the fuel made by processing the plant products like seeds, trunks and other parts of plants. Major plants used are corn, soya bean, sugar byproducts and Jatropha. Bio fuel is being used by Indians for lighting purpose and to run mechanical engines.

The government has started with 5% mandatory ethanol blending. However, India at this point is not self-sufficient in bio-fuel production. There is a need to scale up the production. Many state governments has taken initiatives in this regard, with the help of central government. Few bio-disiel crops like Jatropha doesn't need farm land. They can be grown on sub-standard soil and in arid and semi-arid regions. The arid regions in South India, North West India can get opportunity in this. Few states like Karnataka, Andhra, Chattashgarsh has committed for large production.

The major challenge is human resources, who can take better management of plants. It doesn't require high education profile. Hence is suitable for people with formal education to be turned into farmers in government land. This reduces the migration. Further, there is a need to do



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research and refine the existing breeds. Like other crops, stable price for the farmer produce is key to scale up this sector in the long term. Agreements with oil companies help in this regard.

Hence, the bio-fuel sector is having both opportunities and challenges. It's up to the government to take it forward.

- How far the Coastal Regulation Zone notification has addressed the problems of Indian fisherman? Why it is important for India to have CRZ? (150 Words)

Indian has more than 7000 km coastal line and major chunk of its population residing in coastal areas depends on coastal ecosystem for its employment and fulfill its protein needs. Industrial activities in coastal area, discharge of pollutants in coastal areas etc. can severely impact the coastal ecosystem and specially the fisheries sector. To regulate the development activities along the coastal line, GOI introduced coastal regulation Zone notification. Coastal area was divided in to different zone with separate list of activities permitted/prohibited for each zone.

CRZ notification has improved the awareness among the fishermen communities and given them right to join in consultation meets for any coastal development activity. CRZ has not put any restriction on any fishing activity for traditional fishermen communities' .In some of states such as Goa, Maharashtra special provision such permission of construction activities etc. have been added in to the act. But CRZ act was implemented with set of exception and over a course of time, exception list has increased that sometime undermine the real intent of the act

India has a vast coast line of 7500 KM; associate features like mangroves, creeks; large fishing community depends on it for livelihood. The coastal waters have impact on monsoon, weather pattern. Mangroves play key role in stopping calamities and decreasing pollution. In this scenario, sustainability of this coastal environment, management of development activities assumed importance. MoEF has issued Coastal Regulation Zone 2011 notification under Environment act 1986 for this purpose, with improvement over earlier one.

There are many new provisions, which will benefit fisher folks. Their dwelling units, repair works are exempted from regulation. Measures are provided to reduce the pollution in coastal waters, which if implemented allows fish growth. SEZ are disallowed in these regions, thus securing access to the people. No restriction is imposed on fishing in estuaries, creeks etc. However, the no development zone is reduced from 200meters from HTL to 100 meters, thus



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more density in development and stress on coastal water, which will impact the availability of these resources to fishing community.

- The Plastic Waste (Management and Handling) Rules, 2011 has created uproar in the general masses. Substantiate the core objective of the rule citing problems of its implementation? (150 Words)

The Waste (Management and Handling) Rules, 2011 replaces the earlier Recycled Plastics Manufacture and Usage Rules, 1999.

Some of the salient features of the new Rules are ban on use of plastic materials in sachets for storing, packing or selling gutkha, tobacco and pan masala, no food stuffs will be allowed to be packed in recycled plastics or compostable plastics, recycled carry bags to have specific BIS standards, colour to the prescription by the Bureau of Indian Standards (BIS), uniform thickness shall not be less than 40 microns in carry bags.

One of the major provisions under the new Rules is the explicit recognition of the role of waste pickers. The new Rules require the municipal authority to constructively engage agencies or groups working in waste management including these waste pickers. This is the very first time that such a special dispensation has been made.

The Municipal authority shall be responsible for setting up, operationalisation and coordination of the waste management system and for performing the associated functions, This include to ensure safe collection, storage, segregation, transportation, processing and disposal of plastic waste:, no damage to the environment during this process, setting up of the collection centers for plastic waste involving manufacturers, its channelization to recyclers:, to create awareness among all stakeholders about their responsibilities, and to ensure that open burning of plastic waste is not permitted.

The new laws have created an uproar with the plastic manufacturers as the cost of manufacturing thicker plastic sachets is high and the usage by local vendors has not picked up.

- Differentiate between C-band and S-band with their respective roles?(100 Words)



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The C band is a name given to certain portions of the electromagnetic spectrum, including wavelengths of microwaves that are used for long-distance radio telecommunications. The IEEE C-band (4 GHz to 8 GHz) – and its slight variations – contains frequency ranges that are used for many satellite communications transmissions, some Wi-Fi devices, some cordless telephones, and some weather radar systems.

The S band is part of the microwave band of the electromagnetic spectrum. It is defined by an IEEE standard for radio waves with frequencies that range from 2 to 4 GHz, The S band is used by weather radar, surface ship radar, and some communications satellites, especially those used by NASA to communicate with the Space Shuttle and the International Space Station.

- To ensure the sustainability of Non-conventional energy sources there is need for more innovative approach like “Green Energy Corridor”. Comment (200 Words)

India is a tropical country with varied topography and coast line. The potential for wind, solar energy is very high. However, these are not harnessed as needed. Major problem is to produce a grid scale energy, at comparative price. The technical difficulties include cost of unit electricity, which is high. Hence, discoms are not interested in purchasing this power.

Innovative approaches to production and distribution are required to make this viable. Government has come up “Green Energy Corridor” project with assistance from Germany. As part of this, renewable energy sources in various states will be connected to national grid through special corridor. Power Grid Corporation has already started the work. These approaches sometimes give spill over benefits. Power is generated from solar panel placed on canals in Gujarat, thus saving water and space, consequently the cost is less. Solar panels which change the direction with movement of Sun is another good approach. Similarly, India can harness the offshore wind energy. A coastal network of wind energy can be made. Thus, pursuing these kind approaches will enable the adoption of renewable energy on large scale.

- How far IPR legislations and Biodiversity agreements have gone to provide safeguards to Traditional Knowledge? Substantiate. (200 Words)

In a globalized world with knowledge economy, Traditional Knowledge is increasingly assuming importance. It includes medical knowledge, plants and animal properties cultural elements like songs. National governments have enacted legislation to secure their traditional knowledge. In India, we have Biodiversity Act and established NBA. Nagoya protocol was



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formulated for equitable access. CSIR is taking steps to track the traditional knowledge. Geographical Indication tag being used for products, not to the cultural elements.

However, these legislations are not reining in MNC from exploiting traditional resources. Few companies are taking away resources without information, consent, benefit sharing. Mahyco egg plant episode in Maharashtra, attempt to patent turmeric and Basmati are examples. Here, the laws came handy in stopping the misuse. Recently, Disney has used tribal songs from South Africa without their acknowledgement. An UK based company got patent on a particular plant gene that these communities are traditionally been using. The South African house is going to make legislation now. Here, the international conventions are grossly violated. Hence, mere laws won't suffice, without community awareness.

- Critically examine the increased Carbon Trading to control GHG emission. (20 Words)

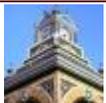
Carbon trading is a market based approach to control the emissions by providing incentives to reduce individual emissions. In this approach, every major industry has certain cap on emissions, which it can't breach. However, it can balance the excess emission by buying credits from another company who saved the credits.

Carbon trading was introduced in Clean Development Mechanism of Kyoto protocol, which has binding commitments for developed world. To meet this, these countries bought credits from developing countries, thus it led to investment in developing countries. This has an inherent weakness. If the real reduction was done in home country, it will impact the business of company and costs more compared to emerging countries. Ironically, this is turned into method to continue the emissions and reductions are done only in theory and on paper.

Further, this diverted the attention from the real reductions, collective political action that is required. Polluting industries are moved to the countries having surplus credits. Thus, the carbon trading mechanism tends to go away and failed to achieve the real objective. This should be taken into mind, while framing post-2020 plan.

- What paradigm shift NRHM has brought in the field of public health?(200 Words)

NRHM was launched in 2005 with objective of providing affordable, accessible health care. Innovative approaches were taken to meet the scarcity of personnel, equipment, social interface.



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The missions was launched in selected states and expanded gradually. This helped in focus on states like NE and improves upon the experience. ASHA, Accredited Social Health Activist was emerged as an interface between the deprived sections and medical personnel. She can interact with the people in known social and cultural ways. Good improvements are brought mother and child care. Involvement of AYUSH augmented the existing capabilities and provided cheap medicine. It can be reverse improved upon traditional knowledge from NE tribal. Equipment for diagnosis, training modules for ANM helped in modernizing the system.

The central government has not prescribed the modalities to carry out the health care and provide decentralization. State-specific best practices are evolved and funds can be utilized as per relative needs of states. TN is able to supply almost 100% pharmacy needs through procurement at state level and generic drugs.

Enough emphasis was given on sanitation, nutrition. Village committee, Hospital Welfare committees are formulated, thus involving the community in the implementation. Specific interventions for Iron deficiency helped in reducing MMR due to anemia. Thus, the innovative design and implementation helped in providing affordable care, which is to be emulated in NRUM.

- “With the liberalization of global trade in agriculture there is an increased risk of introduction of exotic pests and weeds in the country that can cause serious economic”. How far Biosecurity Bill, 2013 addresses this problem? (200 Words)

With developments in bio technology, competitive trade, there is danger of bio terrorism, bio theft in agricultural sector. Bio Security Bill 2013 was aimed at securing agricultural eco-system.

Agricultural Bio Security Authority would be created to regulate the import and export of bio organism, prevent the alien pests, and control the quarantine pest. The authority can control an area as Quarantine area, can declare Biosecurity Emergency with the approval of Union. This provision helps in containing the pest or virus and eliminating it. This helps to contain the cases like Avian in flu and bg99. The bill lacks provisions regarding capacity building like labs, personnel. There is an overlap between this authority and National Biodiversity authority under Bio-diversity act. The two agencies should be clear on the responsibilities. The authority should



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be given the regulation of pesticides to prevent the virus from generating resistance and mutations.

The grievance redressal mechanism against the orders of the authority is commendable, but should be ensured not to misuse or cause delay. The penalties stipulated for violation of the provision is 2 years imprisonment and 2 lakhs. This needs to more stringent. Overall, the enactment of this bill will act as a positive step in ensuring the safety and security of plant and animal species, the livelihood of majority.

- Discuss the plausible health and environmental impacts of nanotechnology? (150 Words)

Nano technologies use the material of very miniscule scale. Nano technology based manufacturing process has been found to consume lesser energy and they produce lesser material waste. This will result in reduction of environment footprint of industries. Nano technologies help to provide more accurate measurement of water & air quality compare to the traditional methods. Nano catalyst based products have potential to control the toxic emission from industrial and vehicle emissions. Nano technology has been found to increase the product life that will reduce the frequent resources pressure on environment.

But nanotechnologies can have severe health and environment impact as well . particles used are of small size & shape and uncertain chemical compositions. There is no substantial information about the impact of nano waste on different component such as water,air etc. of our environment. Once they are released in to atmosphere they might remain undetected for long and it will be difficult to take remedial action in case of any hazards cause due to nanoparticles. Smaller size particle of any element are more reactive than the particle in bulk. There is a greater scope that Nano particles may penetrate the human cells and critically affect the DNA composition or cause health issues. Smaller size of used particles also creates a problem in recycling & recovering of such particles for sustainable use.

- The power sector reforms in India should be distribution led instead of generation led”. Do you agree? (200 Words)

Availability of electricity at cheaper rate is must for the socio-economic development of country. Since Independence generation of electricity in India has increased manifolds but still 40 % of the India population lives without electricity. Electricity supply chain consists of 3



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important activities generation, transmission & distribution. T&D remains the weakest link in the supply chain. India lose nearly 20-40 % of its electricity generated while Transmitting & distribution it to the end customers. In most of the developed countries losses are near 10 %.

In Most of the Indian states, state electricity board have monopoly in the distribution network. State discoms financial health is in poor condition and they lack resource to invest in technology to improve the distribution network to tap the losses. Lack of competition in distribution is also one factor that has made state agencies inefficient. Government of India has issued onetime bailout package to the state discoms and coming out with scheme to incentivise the states board who are able to reduce the losses. GOI has also directed state government to pull in private players in distribution network (especially in big cities) to bring in competition & efficiency in the sector.

We will end up wasting our limited natural resources if we don't fix the distribution losses and focus solely on increasing the generation capacity.(vipul)

The insufficient power infrastructure impacts the industrial development, rural development, thus, GDP growth. The two stage solution is to generate the required and distribute it efficiently. However, the former is going forward, while latter is stand still.

In case of generation reforms, Private sector has largely participated and the capacity has increased. The government embarked on nuclear energy and its progressing. There is an idle capacity; hence there is a need to increase the fuel supply.

On the distribution side, welfare politics are playing spoil sport. The free power for agriculture, cross subsidization leads to low industrial development and rural migration. Discoms are becoming debt burdened. The private participation is nil, and states are unwilling to do it. The technical losses and theft are major issues.

We need to continue the reform in generation, but more emphasis and energies should be placed on pushing reforms in distribution sector.

- Prize based accolades have lot to offer in the field of research and development, rather than patent based? How far you agree with this statement. (200 Words)



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Motivation is a prerequisite for any kind of success, especially in a field like research. Scientists get motivated by publishing scientific papers in a journal, by winning prizes for their work or by patenting their products for monetary gain. Patenting will get them royalties for a long time, but not much recognition. Patents usually go to the company that the scientist works for. Unless he is working on the product individually, which is very rare, so it seldom acts as a motivation.

Whereas, prizes give scientists world-wide recognition and will ensure that he works more because all eyes will be on him now. But, instead of few high paying prizes which go for established scientists, there should be many small prizes which can be awarded to many more scientists, especially young ones. This will energize a lot more people to contribute to research. So, more research expos, exhibitions, scientific conferences etc. should be organised where a lot of people can showcase their work and can win recognition amongst their peers. This will ensure R&D grows manifold. This is not possible in patent based accolades. Therefore, social recognition acts as a better motivational need than money.

- Compare and contrast the generation of launch vehicles used and developed by India. Also highlight the issues associated with each generation? (250 Words)

Launch vehicles play an important role in the space program of the country. They are used to put the satellites in orbits and transport the space crafts in to the space. India started its launch vehicle development program in 1970s .India's launch vehicle program started with SLV-3, later an upgraded version of this was developed in 1990s. Since then India has made a tremendous progress. Country has got the self-reliance in development of Polar satellite launch vehicle and geosynchronous satellite launch vehicle.

PSLV has been the most successful story so far. PSLV is very reliable and world class vehicle India has developed. PSLV has been used not only to put several satellite of domestic use in orbits but also it has been used to launch the satellites for foreign customer under commercial agreement. PSLV was used to carry out India most popular Chandrayan -1 program and recently used in Mars orbiter mission as well.

GSLV is used to put the heavy communication satellite in geosynchronous orbit. GSLV consist of three stages. First stage is a solid engine, second a liquid and third stage is a cryo engine. Third stage is using indigenously developed complex cryogenic engines. GSLV has been under



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development for more than 2 decades but still it has several problems. GSLV was first used in 2001. GSLV story of India has not been very pleasant so far and seen consecutive failure in last few years.

GSLV Mark 3 is another launch vehicle that is still under development .GSLV 3 will make India capable of launching heavier satellites in the space. Vehicle is also expected to make India a big player in competitive commercial launch market.

Launch vehicle is the rocket used to place the satellites and other pay loads in required orbits. Till 1970, India has to depend on other countries. To geo-political compulsions, India has started its own programme for launch vehicle development.

There are four three generation of launch vehicles, namely SLV, ASLV; PSLV; GSLV. The SLV, ASLV are experimental vehicles to test the critical technologies. They achieve 50% success in launches and put foundation for later programme. They have used to send the Rohini series satellites. The pay load was confined to 100KG. Hence, for INSAT and IRS satellites India continued to depend.

The PSLV has became, the most successful and more used launch vehicles. Multiple payloads can be placed by using PSLV, in varied orbits. The payload weight can be 1000-1500KG and in various orbits like LEO, GSEO. It helped to in securing the commercial launch sector. This can be used to do “Space diplomacy” with other countries. PSLV has used in Chand Rayan and mars missions.

The last generation is GSLV, with Cryogenic stage. After Russia refused knows how, ISRO started its own cryogenic development. The experimental launches have failed and thrown challenges to crack cryogenic technology. GSLV is important to send higher payloads of 4000 KG, to remove the dependency on French Guyana. It is also important for Aditya project that is set to study the coronas of Sun.

- **1. The convention on biodiversity is to answer the equitable use of biodiversity. How this objective is reflected in the subsequent protocols adopted on biodiversity? (200 Words)**

Equitable access to biodiversity sources and the sharing of benefits is one of the core objectives of CBD 1992. This was elaborated in Nagoya protocol.



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The protocol required the nations to make legislative structure required to provide access to provide access to local resources to national and international companies. Accordingly, India enacted BD Act and setup NBA. NBA is mandated to regulate the usage of resources for commercial purposes.

In practice, MNC are employing exploitative techniques. The Mahyco' eggplant episode reflects this. The tropical countries are rich in species and traditional knowledge, where the higher altitudes countries have know how to exploit these on commercial scale. Recently, a UK based MNC patented a gene for weight loss from South Africa, that is used by tribals to mitigate thirst and hunger. This was done without acknowledgement and no benefit sharing.

These incidents show that the protocol was practiced only in access and not fair access and benefit sharing. Hence, the countries should place vigilant regulatory architecture to secure their resources.

- **After Fukushima meltdown of 2011, the nuclear sector has geared for increased safety in new projects and also in the existing ones. Highlight the steps taken for such an objective? What is the role of IAEA in this? (250 Words)**

Fukushima accident happened in year 2011 due to an earthquake & Tsunami that disabled the cooling system in power plant and led to fuel meltdown. After the accident, nuclear powers worldwide have emphasized on the need for additional safety measures , expert & independent regulatory bodies and transparent mechanism to make public aware about the nuclear issues.

In India Atomic regulatory body has issued guidelines to all the plant to carry out technical safety review against the new benchmarks and have asked the plants to make their report public. Plants have been asked to install additional safety measures if needed. India has also included liability clauses in its new project contract to make the supplier responsible for any nuclear disaster due to negligence on their part. India government has drafted a bill to establish a legal authority and regulatory bodies for Nuclear safety .

IAEA is an international body that works with its member countries and other partners to promote the safe, secure and peaceful use of nuclear energy. Taking the lesson from Fukushima



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disaster, IAEA has created an action plan for member and suggested that IAEA regulations should be considered for drafting the nuclear safety legislation in member countries. IAEA has emphasized on the role of independent, competent and well equipped with human & financial resources national regulatory authorities in member countries. As the countries cannot predict the level of damage from a nuclear accident, it becomes necessary that worldwide consultation is promoted to handle such uncertainties. IAEA can bring an effective mechanism for the sharing of scientific information & exchange of expertise .

- **“In the present era Indian achievement in Science and technology is confined to few sectors”. Identify those technological realms where India needs to focus more to ensure the balance among all sectors?**

Independent India envisaged science and technology as a tool for economic growth, social development, and nation building. Programmes were started in the field of space, nuclear energy, and missile technology. The space programme was most successful and generated many benefits at society level. The nuclear energy program is yet to derive tangible benefits. The missile programme was successful, but social content is less. In this scenario, there is a need to focus on other areas, for equitable development.

Agriculture was not given deserved attention. Initial progress was made in irrigation. The green varieties were borrowed from Philippines and Mexico. The sector, where 45% of population depends need focus. Low cost tractors, other equipment helps marginal farmers in increasing productivity. The arid and semi arid crops need to be refined. In Agricultural processing – preservation methods are required.

National Innovation council was established to transform innovation into commercial level. MSME technology required to be upgraded. Low cost housing, waste treatment, clean energy are the sectors that need focus. The cyber security, nano technology requires investments and capacity building. Vaccine development, low cost medicine is other fields.

Hence, government need to balance the sectors with scientific value and social value.



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Left without answering

- “Too many international conventions and agreements on climate change have perplexed and disappointed the world”. Comment. (200 Words)
- “All debates about scientific research inevitably end up zeroing in on the deficiencies of our educational system as the root cause of the abysmal record in scientific research.” Do you agree with the statement? Critically comment. (200 Words)
- In the present era Indian achievement in Science and technology is confined to few sectors”. Identify those technological realms where India needs to focus more to ensure the balance among all sectors?(200 Words)

