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INFUSION NOTES
WHEN ONLY THE BEST WILL DO

U.P.S.C

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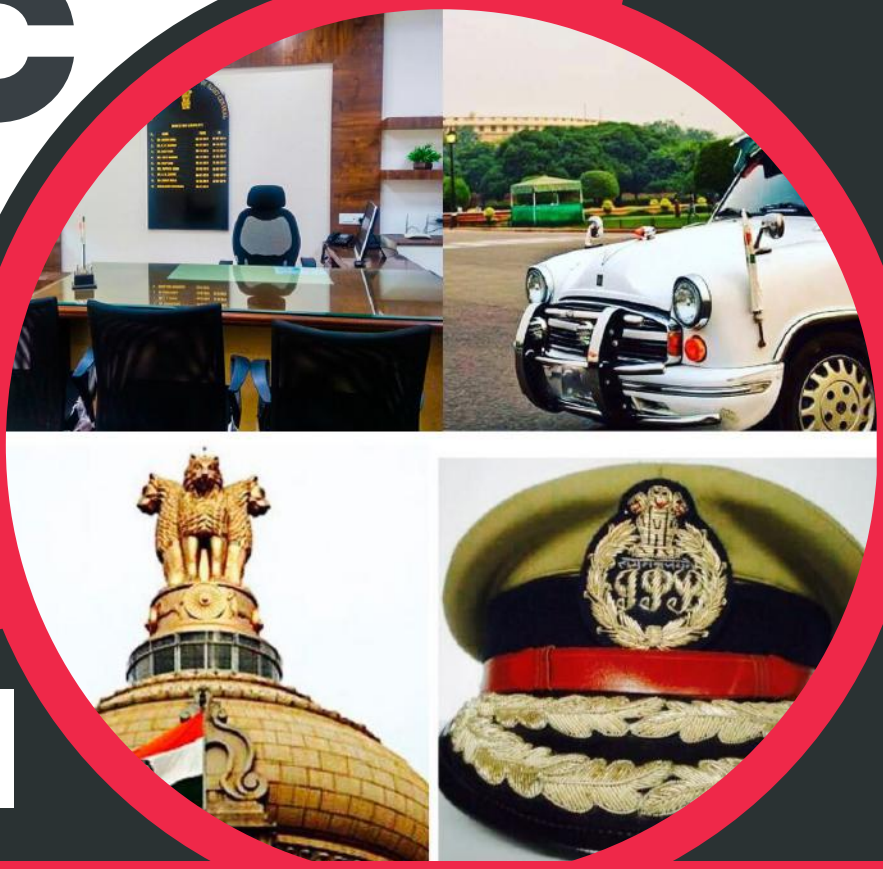

LATEST EDITION

HANDWRITTEN NOTES

PRE+ MAINS

General Study paper - 3

Part – 3 Science and Technology

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UNION PUBLIC SERVICE COMMISSION (U.P.S.C.)

GENERAL STUDY PAPER – 3

Part – 3 Science and Technology

PREFACE

Dear Aspirants, Presented Notes ***"UPSC – CSE (PRE + MAINS)"*** *have been prepared by a team of teachers, colleagues and toppers who are expert in various subjects.*

These notes will help the Aspirants to the fullest extent possible in the examination Of Civil Services conducted by the ***UNION PUBLIC SERVICE COMMISSION (UPSC).***

Finally, despite careful efforts, there may be chances of some shortcomings and errors in the notes / So your suggestions are cordially invited in Infusion notes.

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EDITION – LATEST (2022)

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CHAPTER – 2

BIOTECHNOLOGY

Biotechnology is the use of biological systems found in organisms or the use of the living organisms themselves to make technological advances and adapt those technologies to various fields.

Biotechnology is the field that exploits living organisms to make technological advances in various fields for the sustainable development of mankind.

The European federation of biotechnology defines it as "The integration of natural science and organisms, cells, parts thereof and molecular analogues for products and services".

Biotechnology is the use of an organism, or a component of an organism or other biological system, to make a product or process for a specific use.

It can include both cutting-edge laboratory techniques and traditional agricultural and culinary techniques that have been practiced for hundreds of years.

Brewing and baking bread are examples of processes that fall within the concept of biotechnology (use of yeast (= living organism) to produce the desired product).

- Such traditional processes usually utilize the living organisms in their natural form (or further developed by breeding), while the more modern form of biotechnology will generally involve a more advanced modification of the biological system or organism.

With the development of genetic engineering in the 1970s, research in biotechnology (and other related areas such as medicine, biology etc.) developed rapidly because of the new possibility to make changes in the organisms' genetic material (DNA).

Biotechnology deals with industrial scale production of biopharmaceuticals and biologicals using genetically modified microbes, fungi, plants and animals.

The applications of biotechnology include therapeutics, diagnostics, genetically modified crops for agriculture, processed food, bioremediation, waste treatment, and energy production.

Beer brewing: In beer brewing, tiny fungi (yeasts) are introduced into a solution of malted barley sugar, which they busily metabolize through a process called fermentation. The byproduct of the fermentation is the alcohol that's found in beer. Here, we see an organism – the yeast – being used to make a product for human consumption.

Penicillin: The antibiotic penicillin is generated by certain molds. To make small amounts of penicillin for use in early clinical trials, researchers had to grow up to 500 liters of "mold juice" a week. Here, an organism (mold) was used to make a product for human use – in this case, an antibiotic to treat bacterial infections.

***IVF, or in vitro fertilization**, is a technique used to help a woman get pregnant. It is when a human egg is fertilised with sperm in a laboratory. IVF is used to treat infertility and some genetic problems.*

***Gene therapy:** Gene therapy is an emerging technique used to treat genetic disorders that are caused by a nonfunctional gene. It works by delivering the "missing" gene's DNA to the cells of the body.*
In gene therapy, biological components from different sources (a gene from humans, a plasmid originally from bacteria) are combined to make a new product.
***Tissue culture,** a method of biological research in which fragments of tissue from an animal or plant are transferred to an artificial environment in which they can continue to survive and function.*
***Biotechnology** has additional applications in areas such as food production and the remediation (cleanup) of environmental pollution.*

Principles of Biotechnology

***Genetic Engineering:** Techniques to alter the chemistry of genetic materials (DNA and RNA) and to introduce these into host organisms and thus change the phenotype(observable physical properties of an organism) of host organisms.*

***Maintenance of Sterile** (microbial contamination free) ambiance in chemical engineering processes to enable the growth of only desired microbe/eukaryotic cell in large quantities for the manufacture of biotechnological products like antibiotics, vaccines, enzymes, etc.*

Genetic Engineering

Genetic Engineering is a technique of manipulating the genome of the organism, to add one or more trait that is not found in organism naturally. Also, called gene manipulation /genetic modification.

Techniques

1. ***Isolation of genes:** Desirable sequence of genes is obtained directly from the genome of normal cells or from other cells, which is achieved by cleavage and denaturation. DNA is extracted from cells.*
2. ***Synthesis of genes:** Various methods are deployed for the same.*
3. ***Recombinant DNA:** Cutting of DNA molecule at a desired position results in a new gene product which is called as recombinant DNA (r-DNA). The receiving organism is said to be transgenic. Using this technique, we can isolate and clone a single copy of a gene or DNA molecule into an indefinite number of copies all identical.*
4. ***Gene cloning:** Isolation of gene and reproduction of a single copy of gene or DNA segment into the infinite number of copies all identical is known as gene cloning.*

Hazards of Genetic engineering

- *If a wrong DNA segment is inserted and it gets expressed, it can cause new diseases in human beings.*
- *It can be used in biological warfare.*
- *Genetical modification of existing species/recreation of extinct species can cause disaster*
- *New strains of bacteria/fauna can come out of the lab which can be hostile to human beings.*

- Even in a single species, genetic engineering leads to the elimination of varieties – if some new disease comes up, the entire species may be wiped out.

National Genomic Grid

- Health Minister announced plans of Genomic grid for India-specific cancer research.
- In a move to take cancer research to the next level and make treatment viable for people of different economic classes, the government has plans to set up a National Genomic Grid, which will study genomic data of cancer patients from India.
- The grid to be formed will be in line with the National Cancer Tissue Biobank (NCTB) set up at the Indian Institute of Technology, Madras, and will collect samples from cancer patients to study genomic factors influencing cancer and identifying the right treatment modalities for the Indian population.
- The government plans to set up the National Genomic Grid in the same style with pan-India collection centers by bringing all cancer treatment institutions on board
- The grid will have four parts, with the country divided into east, west, north, and south.

National Cancer Tissue Biobank (NCTB):

It is a joint initiative of the Department of Science and Technology (DST), Government of India, and Indian Institute of Technology, Madras.
The NCTB is functioning in close association with the Indian Council for Medical Research (ICMR).
NCTB, which has the capacity to stock 50,000 genomic samples from cancer patients, already has samples from 3,000 patients. The genomic samples will help researchers to have India-specific studies on cancers.

Color Classification of Branches of Biotechnology:

- **Gold biotechnology or Bioinformatics:** Computational Biology à address biological problems using computational techniques.
- **Red Biotechnology:** Biopharma à relates to medicine and veterinary products.
- **White Biotechnology:** Industrial Biotech à to design more energy efficient, low resource consuming products.
- **Yellow Biotechnology:** Biotech in the Food Industry.
- **Gray Biotechnology:** Environmental applications to maintain Biodiversity.
- **Green Biotechnology:** Emphasizes on Agriculture interests.
- **Blue Biotechnology:** based on use of marine resources.
- **Violet Biotechnology:** deals with law, ethical and philosophical issues of biotechnology.
- **Dark Biotechnology:** associated with bioterrorism and biological weapons.

GENE:

- Gene is the basic physical unit of inheritance.
- It is a part of the DNA in a cell that controls the physical development, behavior, etc. of an individual plant or animal & is passed on from its parents.

GENOME:

- Genome is the complete set of genes or genetic material present in a cell or organisms.

- The human genome is a complex set of instructions, like a recipe book, directing organism growth & development.

GENOMIC ORGANIZATION:

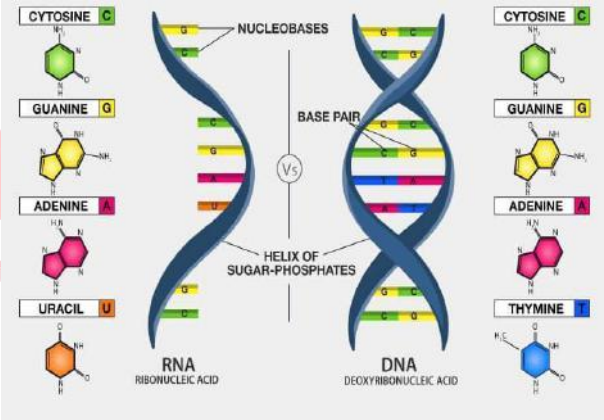
- This refers to the linear order of DNA elements and their division into chromosomes.
- Can also refer to the 3D structure of chromosomes & the positioning of DNA sequences within the nucleus.

CHROMOSOME:

- These Are thread-like structures located inside the nucleus of animal & plant cells.
- Each chromosome is made of protein and a single molecule of Deoxyribose-Nucleic Acid (DNA).
- Chromosomes are a key part of the process that ensures DNA is accurately copied and distributed in the vast majority of cell divisions.
- Changes in the number or structure of chromosomes in new cells may lead to serious problems like: Down Syndrome, Turner Syndrome etc.

DNA and RNA

- DNA contains the sugar deoxyribose, while RNA contains the sugar ribose. The only difference between ribose and deoxyribose is that ribose has one more -OH group than deoxyribose, which has -H attached to the second (2') carbon in the ring.
- DNA is a double-stranded molecule while RNA is a single-stranded molecule.
- DNA is stable under alkaline conditions while RNA is not stable.
- DNA and RNA perform different functions in humans. DNA is responsible for storing and transferring genetic information while RNA directly codes for amino acids and as acts as a messenger between DNA and ribosomes to make proteins.
- DNA and RNA base pairing is slightly different since DNA uses the bases adenine, thymine, cytosine, and guanine; RNA uses adenine, uracil, cytosine, and guanine. Uracil differs from thymine in that it lacks a methyl group on its ring.



Comparison of DNA and RNA

S.No.	DNA	RNA
1.	Deoxyribonucleic acid.	Ribonucleic acid.
2.	It occurs inside the nucleus of cell and some cell organelles but it plants it is present in mitochondria and plant cell.	It is found in cytoplasm of the cell but very little is found inside the nucleus.
3.	It is a double-stranded molecule consisting of a long chain of nucleotides.	It is single-strand helix having shorter chains of nucleotides.
4.	It stores and transfers genetic information	It is used to transfer genetic code from

- Another important function of nucleic acids is the protein synthesis in the cell. Actually, the proteins are synthesized by various RNA molecules in the cell but the message for the synthesis of a particular protein is present in DNA.

DNA Fingerprinting

- It is known that every individual has unique fingerprints. These occur at the tips of the fingers and have been used for identification for a long time but these can be altered by surgery.
- A sequence of bases on DNA is also unique for a person and information regarding this is called DNA fingerprinting. It is the same for every cell and cannot be altered by any known treatment.

DNA fingerprinting is now used–

- in forensic laboratories for the identification of criminals.
- to determine the paternity of an individual.
- to identify the dead bodies in any accident by comparing the DNA's of parents or children.
- to identify racial groups to rewrite biological evolution.

Recombinant DNA

- In 1953, scientists discovered the structure of DNA, and in 1972, researchers developed a method for cutting and splicing DNA. That method became known as recombinant DNA or rDNA.
- Recombinant DNA (rDNA) molecules are DNA molecules formed by laboratory methods of genetic recombination (such as molecular cloning) to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in the genome.
- Recombinant DNA is possible because DNA molecules from all organisms share the same chemical structure. They differ only in the nucleotide sequence within that identical overall structure.
- In most cases, organisms containing recombinant DNA have apparently normal phenotypes(observable physical properties of an organism), That is, their appearance, behavior, and metabolism are usually unchanged.

The basic steps involved in Recombinant DNA Technology:

- Isolation of a DNA fragment containing a gene of interest that needs to be cloned (called as insert).
- Generation of a recombinant DNA (rDNA) molecule by insertion of the DNA fragment into a carrier DNA molecule called vector (e.g. plasmid) that can self-replicate within a host cell.
- Transfer of the rDNA into an E. coli host cell (a process called transformation).
- Selection of only those host cells carrying the rDNA and allowing them to multiply thereby multiplying the rDNA molecules.
- The whole process thus can generate either a large amount of rDNA (gene cloning) or a large amount of protein expressed by the insert.
- The first rDNA molecules to be generated using these procedures were established by the combined efforts in 1973 by the molecular biologists' Paul Berg, Herbert Boyer, Annie Chang, and Stanley Cohen.
- The next step after a recombinant molecule has been generated is to introduce it into a suitable host.
  - There are many methods to introduce recombinant vectors and these are dependent on several factors such as the vector type and host cell.

Some commonly used procedures are:

- **Transformation**
- **Transfection**
- **Electroporation**

- Two types of gene therapy: Somatic gene therapy, Germline gene therapy.

Gene Editing:

- Gene editing is a technique of making specific changes to the DNA at a specific sequence.
- For this DNA is inserted, deleted, modified or replaced in the genome.
- For this CRISPR CAS9 Scissor is used.
- It involves making cuts at specific DNA sequences with enzymes called 'engineered nucleases'.

How does genome edit work

- Genome editing uses a type of enzyme called an 'engineered nuclease' which cuts the genome in a specific place.
- Engineered nucleases are made up of two parts:

1. A nuclease part that cuts the DNA.
2. A DNA-targeting part that is designed to guide the nuclease to a specific sequence of DNA.

- After cutting the DNA in a specific place, the cell will naturally repair the cut. We can manipulate this repair process to make changes (or 'edits') to the DNA in that location in the genome.

CRISPR-Cas9:

- CRISPR stands for 'Clustered Regularly Interspaced Short Palindromic Repeats'
- It is the most common, cheap & efficient system used for genome editing.
- CRISPR is the DNA-targeting part of the system which consists of an RNAmolecule, or 'guide', designed to bind to specific DNA bases through complementary base-pairing.
- Cas9 stands for CRISPR- associated protein 9, & is the nuclease part that cuts the DNA.
- The CRISPR-Cas9 system was originally discovered in Bacteria that use this system to destroy invaders.

Zinc-Finger Nucleases (ZFN):

The DNA-binding part of ZFNs is made of zinc-finger proteins, which each bind to about three DNA bases. Different combinations of zinc-finger proteins bind to different sequences of DNA.

The nuclease part of ZFNs is normally a FokI nuclease, which cuts the DNA.

Gene Silencing

- Gene silencing is the regulation of gene expression in a cell to prevent the expression of a certain gene.
- When genes are silenced, their expression is reduced. Ex: the researchers designed two small RNA molecules that silence the fungal genes which produce aflatoxin in Groundnut.
- When genes are knocked out, they are completely erased from the organism's genome and thus, have no expression.

Applications:

- Specific gene silencing using RNAi in cell culture.
- Cancer treatments.
- RNA interference has been used for applications in biotechnology.
- Useful in epigenomic analysis and clinical application of molecular diagnosis.
- Neuro-degenerative disorders treatment.

Mitochondrial DNA:

- In addition to DNA in the nucleus, some DNA is also present in the mitochondria.
- During fertilization the nuclear DNA is formed with 46 chromosomes (i.e., 23 from mother & 23 chromosomes from the father).
- The Mitochondrial DNA has only one chromosome and its codes for only specific proteins responsible for metabolism.
- Mitochondrial DNA is inherited only from the mother & thus it is more effective to trace human ancestry.

THREE PARENT BABY

- Three-parent baby, human offspring produced from the genetic material of one man &two women through the use of assisted reproductive technologies, specifically mitochondrial manipulation (or replacement) technologies & three-person in vitro fertilization (IVF).
- This mechanism involves the replacement of a small amount of faulty DNA in a mother's egg with healthy DNA from a second woman.
- The idea is to prohibit certain genetic diseases being passed on to children.

Indian Cancer Genome Atlas (ICGA): Aims to create indigenous, open-source database of molecular profiles of all cancers prevalent in the Indian population.

Embryo Transfer Technology:

- Embryo transfer refers to a step in the process of assisted reproduction in which embryos are placed into the uterus of a female with the intent to establish a pregnancy.
- This technique (which is often used in connection with 'In vitro fertilization' (IVF)), may be used in humans or in animals, in which situations the goals may vary.
- First performed in 1984.
- **Factors that can affect the success of embryo transfer:**

1. Endometrial receptivity,
2. Embryo quality and
3. Embryo transfer technique.

GM Mosquitoes (GMMs):

- GMMs are mosquitoes that have been implanted with a gene or bacteria which was not originally present or naturally occurring in the insect.
- Why GMMs?
- Each year, more than 700 000 people die from vector-borne diseases (VBDs) such as malaria, dengue, yellow fever, Zika virus etc.,
- Hence, there is an urgent need for new tools to combat
- What does it do?
- GMM approaches aimed at suppressing mosquito populations & reducing their susceptibility to infection, as well as their ability to transmit disease-carrying pathogens.
- The WHO stand on GMMs:
- According to the WHO statement, GMMs could be a valuable new tool in efforts to eliminate malaria & to control diseases carried by Aedes
- WHO cautions, however, that the use of GMMs raises concerns or questions around ethics, safety, governance, affordability & cost-effectiveness that must be addressed.

Genome Sequencing

Genome Sequencing is a laboratory process through which scientists get the complex DNA sequence (in terms of A,T,G,C) of an organism's genome at a time. DNA containing cells such as saliva, epithelial cells, bone marrow, hair, seeds, and plant leaves are used as samples for sequencing. Genome sequencing is done by an instrument called automated DNA sequences.

Human Genome Project (HGP)

The Human Genome Project (HGP) was an international scientific research project with the goal of determining the base pairs that make up human DNA, and of identifying and mapping all of the genes of the human genome from both a physical and a functional standpoint.

- HGP was the international, collaborative research program whose goal was the complete mapping and understanding of the genome (all the genes) of human beings.

- In DMH-11 Mustard, genetic modification allows cross-pollination in a crop that self-pollinates in nature.
- Across the world, GM variants of maize, canola vs soybean, too, are available.
- Bt Cotton is the only GM crop that is allowed in India from 2002.
- Ht-Bt Cotton is not allowed to be cultivated in India.
- Bt Brinjal has been under an indefinite moratorium on commercial cultivation since 2010 in India.

Regulatory Authorities:
GM Food: FASSI regulates manufacture, storage, distribution, sale & import GM food.
For GM Crops: Genetic Engineering Appraisal Committee (GEAC)under MoEF&CC.

Biotechnology in India:

- The remarkable march of India into the world of biosciences and technological advances began in 1986. (Mr. Rajiv Gandhi period)
- In 1986, a separate Department for Biotechnology, within the Ministry of Science & Technology, GoI was created.
- Vision: "Attaining new heights in biotechnology research, shaping biotechnology into a premier precision tool of the future for creation of wealth & ensuring social justice especially for the welfare of the poor."
- BT has made a huge impact on Indian agriculture, healthcare, industry and environment on one hand, while raising the global standing of India.
- The National Biotechnology Development Strategy (2015-2020) aims to make India a US$ 100bn Bio-economy by 2025.

BIO-Technology Kisan programme:

- Farmer-centric scheme, by DBT Ministry of Science & Technology.
- Pan India program to stimulate. entrepreneurship and innovation in farmers and empower women farmers.
- Aims to understand the problems and provide simple solutions to farmers.

Bio-economy or bio-techonomy:

- It refers to all economic activity derived from scientific & research activity focused on biotechnology.
- It is closely linked to the evolution of the biotechnology industry.

Major initiatives of the National Biotechnology Development Strategy

- Launch four major missions in Healthcare, Food & Nutrition, Clean Energy and Education.
- Create a technology development & translation network across India with global partnership.
- Ensure strategic & focused investment in building the human capital by setting up a Life Sciences & Biotechnology Education Council.

Biotechnology Regulatory Authority of India (BRAI)

- BRAI is a proposed regulatory body to regulate the use of Genetically Modified Organisms (GMOs), as per the provisions of the Bill introduced in the Parliament in 2013.
- BRAI was needed as India had signed the Cartagena Protocol and the Protocol mandates setting up of a Regulatory Body.

Genetic Engineering Appraisal Committee (GEAC)

- The GEAC functions under the MoEF&CC.

that the act of sponsoring the treatment of rare diseases would qualify as a CSR activity.

BIOPROSPECTING

It is the process of discovery and commercialization of new products based on biological resources. Despite indigenous knowledge being intuitively helpful, bioprospecting has only recently begun to incorporate such knowledge in focusing screening efforts for bioactive compounds.

Biopiracy is the term used to refer to the use of bio-resources by multinational companies and other organizations without proper authorization from the countries and people concerned without compensatory payment.

Biomining is a technique of extracting metals from ores and other solid materials typically using prokaryotes or fungi. These organisms secrete different organic compounds that chelate metals from the environment and bring it back to the cell where they are typically used to coordinate electrons.

- The people of India in a variety of ways have used neem, since time immemorial. Indians have shared the knowledge of the properties of the neem with the entire world. Pirating this knowledge, the USDA and an American MNC W.R. Grace in the early 90s sought a patent (No. 0426257 B) from the European Patent Office (EPO) on the "method for controlling on plants by the aid of hydrophobic extracted neem oil." The patenting of the fungicidal properties of Neem was an example of biopiracy.

BIOMATERIALS

A biomaterial is a substance that has been engineered to interact with biological systems for a medical purpose, either a therapeutic (treat, augment, repair, or replace a tissue function of the body) or a diagnostic one.

Experts say a number of tissues can potentially be retrieved and stored for use. The Transplantation of Human Organs (Amendment) Act, 2011, includes the component of tissue donation and registration of tissue banks as well.

Biomaterials that can be potentially retrieved and stored –

- **Skin:** It is used as a biological dressing, in cases of major burns. It helps prevent infections and does not need to be changed every day – it can be kept for a couple of weeks, giving the patient time to recover.
- **Bones:** Bones from limbs can be stored and used to replace parts that are damaged or diseased. Bone grafts from banks act as scaffolds for support. They could be used in cases of trauma where there is bone loss, in sports injuries, and in cancer cases where parts of the bone and joint cartilage die. The upper end of the shin bone, the lower end of the thigh bone, and the head of the thigh bone can be retrieved for use.
- **Ligaments and tendons:** These can be used in cases of sports injuries involving multiple ligaments. In some cases, it is difficult to use the patient's own. The Achilles tendon (ankle), the Peroneal tendon (leg to ankle), the Patellar tendon (front of the knee), and the Meniscus (a shock absorber between the thigh bone and leg bone) can be procured for storage.
- **Bone products:** Bone powder is made by crushing bones, generally those that would otherwise be disposed of – such as those parts replaced during hip replacement surgeries. These are used to treat various kinds of defects – in dentistry, skeletal and joint reconstruction procedures.
- **Amniotic membrane:** This is the wall of the amniotic sac. When a baby is delivered, the sac ruptures. The sac can be used as a biological dressing for burns, bedsores,

नोट – प्रिय IAS उम्मीदवारों, यहाँ हमने इस टॉपिक का मात्र SAMPLE ही दिया है, पूरा टॉपिक नही दिया है / यदि आपको हमारे नोट्स के सैंपल अच्छे लगे हों तो कम्पलीट नोट्स खरीदने के लिए नीचे दिए गये हमारे संपर्क नंबर पर कॉल कीजिए या लिंक पर क्लिक करें / दोस्तों, हमें पूर्ण विश्वास है कि ये नोट्स आपकी "UPSC IAS (PRE. & MAINS)" की परीक्षा में पूर्ण संभव मदद करेंगे और आप "INFUSION NOTES" के साथ IAS की परीक्षा में जरूर सफल होंगे, धन्यवाद /

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EXAM (परीक्षा)	EXAM DATE	हमारे नोट्स में से आये हुए प्रश्न
RAS PRE. 2021	27 अक्तूबर 2021	74 प्रश्न (150 में से) CUT OFF – 64
UPSC – IAS PRE. (2022)	05 JUNE 2022	69 (100 में से)
SSC GD 2021	16 नवम्बर	68 (100 में से)
SSC GD 2021	01 दिसम्बर	65 (100 में से)
SSC GD 2021	08 दिसम्बर	67 (100 में से)
राजस्थान S.I. 2021	13 सितम्बर	113 (200 में से)
राजस्थान S.I. 2021	14 सितम्बर	119 (200 में से)

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RAJASTHAN PATWARI 2021	24 अक्टूबर (2nd शिफ्ट)	91 (150 में से)
RAJASTHAN VDO 2021	27 दिसंबर (1st शिफ्ट)	59 (100 में से)
RAJASTHAN VDO 2021	27 दिसंबर (2nd शिफ्ट)	61 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (1st शिफ्ट)	56 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (2nd शिफ्ट)	57 (100 में से)
U.P. SI 2021	14 नवम्बर 2021 1st शिफ्ट	91 (160 में से)
U.P. SI 2021	21नवम्बर2021 (1st शिफ्ट)	89 (160 में से)

& Many More Exams

दोस्तों, इनका proof देखने के लिए नीचे दी गयी लिंक पर क्लिक करें या हमारे youtube चैनल पर देखें –

RAS PRE. – https://www.youtube.com/watch?v=p3_i-3qfDy8&t=136s

VDO PRE. – https://www.youtube.com/watch?v=gXdAk856W18&t=202s

Patwari – https://www.youtube.com/watch?v=X6mKGdtXyu4&t=103s

अन्य परीक्षाओं में भी इसी तरह प्रश्न आये हैं Proof देखने के लिए हमारे youtube चैनल (Infusion Notes) पर इसकी वीडियो देखें या हमारे नंबरों पर कॉल करें।

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CHAPTER – 4

INFORMATION TECHNOLOGY

Information technology (IT) is the use of computers to store, retrieve, transmit, and manipulate data, or information, often in the context of a business or other enterprise. IT is considered to be a subset of information and communications technology (ICT).
Information and communication technology or (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit and manipulate information.

Development in Mobile Technology

- Mobile technology has evolved gradually but at a faster pace.
- It started with IG technology and now has reached to 5G technologies in use and still evolving.
- Its popularity over other electronic devices like laptops, notebooks, tablets, etc. is that it's a complete package and combination of all features in one device.
- Portability and internet connectivity simultaneously with voice communication are cutting edge features.

Networks (Service providers) – Networks have evolved from analog to digital, low bandwidth to high bandwidth, high network coverage, fewer noise disturbances, etc. Few network technologies are 3G, 4G LTE, and WCDMA.

Applications –

- Applications have evolved from low-featured OS to high-end OS features like Android, More User friendly and voice recognition features, gesture recognition, etc. are the newest features.
- Apart from OS development, daily use applications like Online banking, mobile banking, Railway reservation, etc. have now at their fingertips.
- Utility applications like Online FIR registration, online tracking of cases, etc. are new entrants.

'BASH' BUG

- Bash is software that is used in the UNIX operating system.
- It is used as a command prompt for executing commands.
- Most of the MNCs and Govt. security systems use UNIX systems.
- It's a bug that can cause serious security issues.
- The bug can bypass the security and give complete access to the attacker.
- A user can lose its control over his computer system.
- The data and information into the system would become vulnerable to theft and misuse.

'HEART BLEED' BUG

- Heart bleed is a bug in Open SSL
- Open SSL is a protocol used for cryptography.
- This cryptography is used over the internet in communications like IM chats, emails, and data transfers.
- The bug is actually an implementation failure, not a design issue.
- It exposes the secret keys, certificates, IMs, and other confidential information that is into the system.
- It can be visualized as a hole in the pipe through with information that can be bypassed to and fro.

- But the system cannot be overtaken by the attacker. He just can steal the information.
- It exposes serious security issues to those organizations who use this software.
- It leads to the leak of private information.

QR CODES and its application

- Codes are shortcuts to identify something.
- Bar codes are very often used to identify any article's properties.
- These Bar codes can store information into it but that has some limitations.
- A dedicated device like an infrared reader is used to decode the bar codes.
- There is a need for next-generation Code that can meet the demand of time
- QR code means Quick Response Code
- It can be said to be a next-level bar code with enhanced features.
- QR Code is 2-dimensional code, unlike barcode which is one dimensional.
- It can store more information than Barcodes.
- 30% error can be tolerated by QR code. Tampered QR codes can be easily read. It provides robust coding technology.
- QR codes can store diverse information like Web URLs, Pictures, Text information, numbers, etc.
- There is no need for a dedicated device. Smartphone cameras and other digital cameras are enough to scan these codes.
- Simple and easily installable software is needed that translates the bar code into information coded into it.
- It has wide applications from town planning to enterprise. It is being used in business marketing.
- Monmouth in South Wales was converted into a 'Wikipedia town' by putting QR Code Markers at every point. A tourist just needs to scan the code to get information about the place.

Semantic Web

- The web is an interconnection of multiple systems and networks.
- Networks follow different protocols for data exchange.
- Data formats and Web services follow different protocols.
- In its real sense, the Web is very diverse in its operability due to the presence of unstructured components.
- There is a need to have common and intelligent semantics on the web so that the exchange of information becomes easy, fast, and cost-efficient by removing diversity barriers.

The semantic web is a standard developed by World Wide Web Consortium (W3S). The goal of the Semantic Web is to make Internet data machine-readable.

- The standard is meant to define data on the web.
- It uses a common and universal language like XML to define the encountered data
- It can also be said that it is an extension of Old W3 with the new W3 standard (Semantic web).
- It seals the divide between data and information processing by introducing a rule of logic that can automatically draw a conclusion and produce the desired result.
- More intelligence of data processing features is embedded into the Semantic web.
- There are different companies which produce electronics goods with different standards.
- The large volume of data can be exchanged without conversion overhead.
- Data now will become a global element and remain accessible to each and every node with ease and convenience.
- A web search would become more accurate by removing ambiguity.

- E-business, e-commerce, e-governance, e-learning all will come on one platform.
- It will speed up data sharing and information exchange.

Difference between Web 1.0, Web 2.0 and Web 3.0 –

WEB 1.0	WEB 2.0	WEB 3.0
Mostly Read-Only	Wildly Read-Write	Portable and Personal
Company Focus	Community Focus	Individual Focus
Home Pages	Blogs / Wikis	Live-streams / Waves
Owning Content	Sharing Content	Consolidating Content
Web Forms	Web Applications	Smart Applications
Directories	Tagging	User Behaviour
Page Views	Cost Per Click	User Engagement
Banner Advertising	Interactive Advertising	Behavioural Advertising
Britannica Online	Wikipedia	The Semantic Web
HTML/Portals	XML / RSS	RDF / RDFS / OWL

3-D Holography

- Holography refers to a technique that enables the creation of three-dimensional images.
- For this, it uses a laser, diffraction, interference, light intensity recording etc.
- It allows the viewer to feel that the object on screen is moving with respect to the change in position of the viewer thus appearing 3 dimensional.
- Recently Narendra Modi in his election campaign used 3-D Holography to its fullest for connecting to the Indian masses.

WI-FI Backscatter Technology

- It is an emerging technology that uses radio frequency signals as the power source and reuses the existing Wi-Fi infrastructure to provide internet connectivity.
- Its successful advancement would set a platform for the Internet of Things and then connecting billions of devices to the internet would not be a challenge, as the present connection requires excessive battery backup.

DNA Supercomputer

- A Supercomputer that is specialized in genome sequencing.
- It helps in fast DNA sequencing
- It keeps a record of DNA information which will help researchers to analyze how DNA variations manifest themselves in disease.
- It will ensure a high-speed, low-cost sequencing system.
- A number of biotech companies, research centers, and hospitals will be benefited and can show clinical breakthroughs.
- Many diseases, like cancer that need extensive analysis of genome sequencing, can be researched more vigorously.

CRYPTOGRAPHY

- Internet communication could be secure or insecure depending upon the technique used for transmitting digital information over the network.
- With the advancement of Information Technology, most of the information be it private information or public information is being transmitted with high speed and frequency. But is it secure? There have been frequent cases of data theft and information leaks.
- Cryptography is an encoding technique of communication where the actual message is encrypted into an unreadable format using various algorithms. This text is called ciphertext.
- It's then sent over the network. Even if someone sniffs and intercepts the message, he won't be able to interpret the exact meaning of the text.
- The receiver receives the message and decrypts the information into plain text.
- There are two broad techniques of implementing cryptography: Symmetric key technique and Public key technique.
- Cryptography implements the various aspects of information security like data confidentiality, data integrity, authentication, and non-repudiation.

Application –

- It's now used in our day to day actions like Internet banking, ATM transaction, Online Shopping.
- Our email communication is encrypted.
- Personal Chats and messaging systems like WhatsApp, Facebook messaging are also encrypted.

WEBCAST

- Webcast is a presentation technique where audio and video files are transmitted over the internet.
- Webcast is synonymous with broadcast, but webcast is basically on internet communication in digital format unlike analogue communication in the broadcast.
- In webcast streaming, there is a source and there are many listeners and viewers.
- With the growth of IT, webcast has now become popular as it can render remote services like e-learning, webinars, conferences, media, etc.
- In the 2014 general elections, the Election commission used webcast technology to monitor the proceedings of sensitive polling booths in far-flung and disturbed areas.
- The unauthorized movement can be noticed through the steaming. It was available to the general public on the ECI website.

ETHERNET

- A local-area network (LAN) architecture developed by Xerox Corporation
- Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps
- Ethernet is an important technology that performs 'switching' of data traffic traversing through the networks.
- With the increasing demand of high-performance data centers, cloud computing deployments and other heavy Internet services, there is an unprecedented need for robustness and scalability in the services offered by Ethernet technologies.

Digital Snooping

- Digital snooping is like spying on personal information or data. It is a technique of monitoring private and public networks for passwords and data. The interception of data is done at the network layer and can bypass security protocols easily.
- The attacker uses software programs to read the data passed over the network. It searches for the password fields and intercepts them.
- If the password is encrypted, it uses various algorithms and brute force techniques to decrypt them.

NEAR-FIELD COMMUNICATION (NFC)

- NFC is a short-range contactless communication technology based on a Radio Frequency (RF) field using a base frequency of 13.56 MHz
- NFC-enabled devices must be either physically touching or within a few centimeters of each other for data transfer to occur.

RADIO FREQUENCY IDENTIFICATION (RFID)

- RFID technology uses radio waves to passively identify a tagged object.
- An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter.
- Unlike a barcode, the tag doesn't need to be within the line of sight of the reader, so it may be embedded in the tracked object.

INTERNET OF THINGS (IoT):

- The Internet is a network of networks. Each network is connected to thousands of devices.
- IoT is an internet concept where each and every device or object is identified uniquely. Unique id assigned acts as the source of communication.
- These objects can be Smartphone, Laptops, house switching system, temperature adjustment systems, and health care devices
- All these devices communicate with each other as and when required.
- These devices have built-in features like sensors, Wi-Fi connections, and underlining internet connections and can communicate with each other even without human intervention.
- This concept makes life and business easy as we can command and get a response from anywhere.
- In production, different production lines at different locations can be commanded and can communicate with each other from a far distance.
- In hospitality, the ambiance of hotels can be adjusted from distance location as per the guest's request. Example -temperature adjustment, light adjustment, etc.
- Businesses can flourish by making different devices like smartphones and dedicated devices interact with each other for fast decision making and delivery of services.
- In India, CISCO is setting up an IoT hub in Bangalore. This will help in the development of smart cities, smart street lighting, smart safety and security systems, and smart traffic management in the city.
- IoT is the interlinking of digital devices, people, machines, appliances, & other objects with one another through wireless networks.
- It allows machines & people to be connected and communicate as well.
- IoT Applications are many including works of daily life, Industry, Agriculture, Healthcare, Transportation, Governance etc.

IoT and India

- IoT is part of Digital India mission.
- The National Digital Communications Policy, 2018 to aid its development.
- 100% FDI is allowed in the Telecom sector.
- The government has set a target of USD 15 billion for the IoT market by the year 2020. This would be 5 to 6% of the global IoT industry.

Internet Fast Lanes and Controversy

- Internet Fast lanes are the concept of providing fast and dedicated internet speed to privileged customers.
- These customers are ready to pay more than general rates.
- Service providers intend to provide prioritized services to these customers.
- This concept encounters the law of net neutrality.

- Here it's a violation of internet democracy as it doesn't put every netizen on equal footing.
- If it's implemented, it will hamper the free exchange of ideas and knowledge and hence innovation.

E-SWECHA OS

- E-Swecha is a free software development programme to cater to the needs of engineering students.
- In realization of the free software movement in India, it will develop the Operating System (OS).
- The participants of this project are students of different engineering colleges, teaching staff, and a team of academicians.
- The development is based on the UNIX operating system. UNIX operating system is an open-source platform where features can be modified, customized, and added to enhance the functionality.
- The stakeholders would participate in its development work in groups and teams to collaborate and implement the project.
- The development of free software will be opening up new doors of learning and employment generation in India.

SPECIFIC ABSORPTION RATE (SAR)

- It's a standard for safe exposure to radiofrequency.
- SAR is measured as the amount of radiofrequency or electromagnetic frequency absorbed per unit mass of tissue or human body. It's measured in units of Watt per kilogram.
- It has gained importance because of the high exposure of human beings to Mobile radiofrequency.
- It is assumed that exposure of human tissue to high frequency can cause mutation and gene transformation. Hence to meet the health standard FCC has come up with a standard that is tolerable by the human body.
- FCC limit for public exposure from cellular telephones is a SAR level of 1.6 watts per kilogram (1.6 W/kg).
- India, Department of Telecommunication has come up with SAR regulation to check electromagnetic radiation to address health concerns and regulate the Mobile manufacturing industry.

PROJECT LOON

- The Internet has the power to transform society and bring everyone on equal footing.
- Project Loon is an internet project to provide internet access to all over the globe, Started by Google.
- In this set up a network atmosphere of balloons will be created into our space which will communicate with each other and also devices on the ground.
- The place would be the stratosphere and these balloons will float steadily and will be moved by stratospheric wind.
- A special Antenna on the ground would be required to connect with these balloons for data exchange.

The benefits on Google Loon would be:

- It would be easy to use, no need to set up wired networks, and other complexity would be eliminated.
- High-speed internet all over the globe without a glitch.
- It will increase internet penetration and subscriber base.
- The biggest advantage would be its extension to those areas where internet expansion is either complex or not possible. Like forests, deserts, mountains, hilly areas, etc.
- Also, the remote areas will get affordable internet communication which they are deprived of now.
- Hence it will bridge the gap of intent distribution and provide equal accessibility to all.

- In November 2020, the government brought "Over the Top" (OTT) platforms under the ambit of the Ministry of Information and Broadcasting.
- Currently, no law or autonomous body is governing digital content.
- **Self-regulatory code:** Drafted in January 2019 by 8 OTT service providers to self-regulate content on their platforms.

Bandwidth Throttling:

- It is Intentionally slowing or lowering the speed of an internet service by an internet service provider (ISP).
- It is a reactive measure in communication networks to regulate network traffic and minimize bandwidth congestion.

NET NEUTRALITY:

- Internet is altogether a new and open world.
- It's open to everyone from the individual to the business.
- It's accessible to nearly everyone at an affordable price and speed.
- The strength of the internet is its openness.
- This free area is the ground for innovation and competition.
- Ideas and technology exchange with fast speed boosts investment.
- Knowledge sharing and Learning become global and inclusive.
- Net neutrality means that users get unrestricted access to Internet traffic without any discrimination.
- In its real sense net neutrality is "Freedom of Speech and Expression without partiality".
- In the recent past, there have been violations of net Neutrality by certain governments and companies.
- The Federal Communications Commission (FCC) enacted the Open Internet Order in 2010 in order to prevent large telecommunications firms from stifling competition and innovation online.
- The FCC in its Order stated that the net neutrality rules were intended to "preserve the Internet as an open platform enabling consumer choice, freedom of expression, end-user control, competition, and the freedom to innovate without permission."
- Few countries like Chile have enacted laws to protect net neutrality.
- In India, there is no net neutrality law and it is not regulated by the government. India is yet to come up with a transparent and impartial law.
- It keeps the internet free & open.
- Also, enables anyone to share and access information of their choosing without interference.
- India is committed to the principles of Net Neutrality.
- It firmly rejected Facebook's 'org' or 'Free basics', Bharti Airtel's 'Airtel Zero' etc., in India.
- 'Prohibition of Discriminatory Tariffs for Data Services Regulations', 2016 by Telecom and Regulatory Authority of India (TRAI) prohibit 'Telecom Service Providers' from charging different tariffs from consumers for accessing different services.

CLOUD COMPUTING:

Cloud computing is the delivery of different services through the internet. These resources include tools and applications like data storage, servers, databases, networking and software.

EDGE COMPUTING:

- Edge computing is a distributed information technology architecture in which client data is processed at the periphery of the network
- Data is analyzed locally.

Cloud Computing	Edge Computing

CHAPTER- II

DIGITAL INDIA

Programmes, Policies, and Initiatives related to ICT

Digital India Initiative

- **Department of Electronics and Information Technology (Deity)** is an umbrella organization that cooperates and coordinates the implementation of this programme.
- It aims at converting India into a digitally empowered society and knowledge economy.
- All the digital initiatives that are undergoing like the National Broadband Plan and domestic manufacturing policy are integrated and brought under this initiative.

The vision of digital India is:

- **Infrastructure development** that would enable each and every citizen to utilize it to the fullest.
  - Some of these infrastructures include high-speed internet facilities, digital identity, mobile, and phone banking, safe and secure cyberspace.
- **Governance and online services** so that citizens can use it to avail services that remain away from their reach.
  - Some of the facilities include a digital support system, services available in real-time, services that can enable ease of doing a business, electronic and cashless financial transactions.
- **Digital Empowerment of citizen**
  - Only digital literacy can harness the benefits of digitization.
  - Some of the steps would be universal accessibility of digital resources, regional compatibility of digital resources.

Digital India programme stands on nine pillars. They are:

1. Broadband Highways
2. Universal access to phone
3. Public internet access programme
4. E-Governance
5. E-Kranti-electronic delivery of services
6. Information for all
7. Electronic manufacturing
8. IT for jobs
9. Early harvest programme

Mystic Project

It is a secret surveillance project of the National Surveillance Agency of the USA, to record 100% of foreign country's telephone calls. These calls are stored in a database code-named NUCLEON and can be retrieved at a later date using a code-named RETRO. Former NSA contractor and whistle-blower of USA's surveillance program Edward Snowden has revealed this.

Bharat Net Project

Bharat Net Project is the new brand name of National Optical Fibre Network (NOFN) which was launched in October 2011 to provide broadband connectivity to all 2.5 Lakh Gram Panchayats. It was renamed Bharatnet in 2015. The primary objective was to extend the existing optical fibre network up to the Panchayat level. The government had planned to make this network available to telecom service providers and as a highway for transmission of voice, data, and video in rural areas.

Bharat Broadband Network Limited is a Special Purpose Vehicle set up under Companies Act by
Government of India with an authorized capital of Rs. 1000 Cr. It has been mandated to create the
National Optical Fiber Network (NOFN) in India.
A total of around 2,50,000 Gram Panchayats spread over 6,600 Blocks and 641 Districts are to be

covered by laying incremental fiber. The timeline for this ambitious project is two years.

Bharat Net is being funded through Universal Service Obligation Fund (USOF). The Universal Service Obligation Fund (USOF) was established with the fundamental objective of providing access to 'Basic' telegraph services to people in the rural and remote areas at affordable and reasonable prices. Subsequently, the scope was widened to provide subsidy support for enabling access to all types of telegraph services including mobile services, broadband connectivity, and the creation of infrastructure like OFC in rural and remote areas.

A similar amount of investment is likely to be made by the private sector complementing the NOFN infrastructure while providing services to individual users.

- Will extend Broadband facility to all 2.5L Panchayats.
- Utilize UFOS (Universal Services Obligation Fund)
- Will offer 100 Mbps services.
- BSNL, PGCIL, and Railtel will be executing the project on behalf of BBNL.

Critical Evaluation:

- India does not have capacity to produce the required fibre annually. Delay in project.
- 100 Mbps may be too much for rural uses.
- Services to be offered by Private Operators but they may not jump in immediately.
- Laying out of fibre is a big challenge in rural areas
- It is just about the laying of optic fibres. For end-to-end services, service providers will have to set up their own infrastructure at the gram panchayat level. While the initial cost was projected at Rs 20,000 crore for the NOFN project, private companies will need to pump in much more than this amount to offer services to end customers. This may not be a commercially viable proposition, considering the fact that these would be low revenue markets
- Supply of fibre cable is an issue according to annual procurement. It would take more years than projected to have optic fibre for the stipulated project.

Importance

- As per a study conducted by the World Bank, with every 10 percent increase in broadband penetration, there is a 1.4 percent increase in GDP growth
- NOFN will also facilitate the implementation of various e-governance initiatives such as e-health, e-banking, and e-education, thereby facilitating inclusive growth.

Education

- Remote classrooms in rural government schools: Online vocational training courses delivered through rural ICT centers such as the Common Service Centers.

Healthcare

- Telemedicine centers for remote consultation and diagnostics, set up by private healthcare service providers or by rural entrepreneurs in collaboration with private healthcare service providers.

Banking

- Basic banking services to the unbanked population using, among others, the Post Office network
- Doorstep banking services from various commercial banks through the Business Correspondent network maintained by a third-party private provider.

Agriculture

- Internet kiosks for providing agriculture-related information to farmers
- Integrated application platform that pushes agricultural information over SMS and can also be accessed.

- Cert-Fin will also create awareness on security issues through the dissemination of information on its website and operate a 24×7 incidence response help desk.
- It will also provide incident prevention and response services as well as quality management services and will carry out functions similar to Cert-In, which operates at the national level, for priority cybersecurity in the financial sector.
- Cert-Fin will offer policy suggestions for strengthening financial sector cybersecurity to all the stakeholders, including regulators and the government.

How does it impact you?

- Since the country is on a digital drive, it becomes even more important to protect the users from any cyber incidents. Therefore, a national body to monitor cybersecurity in the financial services sector is a good idea.
- However, we will have to see how much time it takes for the government to implement this idea and also how well it will be executed.

The Information Technology Act, 2000

The Information Technology Act, 2000 (also known as ITA-2000, or the IT Act) is an Act of the Indian
Parliament (No 21 of 2000) notified on 17 October 2000.

- It is the primary law in India dealing with cybercrime and electronic commerce. It is based on the United Nations Model Law on Electronic Commerce 1996 (UNCITRAL Model) recommended by the General Assembly of United Nations by a resolution dated 30 January 1997.
- The original Act contained 94 sections, divided in 13 chapters and 4 schedules. The laws apply to the whole of India.
- Persons of other nationalities can also be indicted under the law if the crime involves a computer or network located in India.
- The Act provides the legal framework for electronic governance by giving recognition to electronic records and digital signatures.
- The formation of Controller of Certifying Authorities was directed by the Act, to regulate issuing of digital signatures.
- **It also defines cybercrimes and prescribed penalties for them. It also established a Cyber Appellate Tribunal to resolve disputes arising from this new law.**
  The Act also amended various sections of the Indian Penal Code, 1860, Indian Evidence Act, 1872, Banker's Book Evidence Act, 1891, and Reserve Bank of India Act, 1934 to make them compliant with new technologies.

In the pursuance of section 70-B of the Information Technology Act, 2000 (the "IT Act"), Central Government issued the Information Technology (The Indian Computer Emergency Response Team and Manner of Performing Functions and Duties) Rules, 2013, these CERT Rules also impose an obligation on service providers, intermediaries, data centres and body corporates to report cyber incidents within a reasonable time so that CERT-In may have scope for timely action.

Section 69 of the Information Technology Act, 2000, empowers the central government or a state
government to intercept, monitor or decrypt or cause to be intercepted or monitored or decrypted,
any information generated, transmitted, received, or stored in any computer resource in the interest of the sovereignty or integrity of India.

Cyber Surakshit Bharat

Recognizing the need to strengthen the cybersecurity ecosystem in India, and in alignment with the Honourable Prime

- *Simplification of Licensing Regime- In the wake of the recent row over 2 G scam*
- *Free-roaming and full mobile portability*
- *Voice over Internet Protocol*
- *Cloud Computing and IPV6*

Cloud Computing And Meghraj Initiative

What is Cloud Computing?

- *Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.*
- *Cloud computing in simple terms can be defined as storing and accessing data and programs over the Internet instead of your computer's hard drive. It doesn't just end there. Cloud in the term of Cloud Computing refers to a set of hardware, networks, storage, services, and interfaces that combine to deliver aspects of computing as a service.*
- *So, it is not just that you are going to share information but in cloud computing, even the infrastructure can be shared on a real-time basis on the internet.*

MeghRaj

- *Meghraj is the name given to the initiative of the Government of India for its new program which is going to take advantage of Cloud Computing. Meghraj is just a name coined for the purpose (Megh=Cloud, Raj=Rule i.e. Rule of Cloud Computing). As much absurd as the name seems, but the advantages the Indians will get from this technology are immense. Another name for Meghraj is the GI Cloud Initiative.*
- *It will enable the government to leverage cloud computing for the effective delivery of e-services.*

What are the components of Government Cloud Computing?

- *Five essential characteristics (viz. on-demand self-service, ubiquitous network access, metered use, elasticity and resource pooling)*
- *Three service models (infrastructure as a service, platform as a service and software as a service)*
- *Four deployment models (public cloud, private cloud, community cloud and hybrid cloud)*
- *The Cloud Computing initiative is envisioned to accelerate delivery of e-services provided by the government and to optimize ICT spending of the government.*

Advantages of GI Cloud

- *Optimum utilization of existing infrastructure*
- ***Rapid deployment and reusability:** Any software made available by any government of department in India can be made available to other departments as well without additional costs.*
- ***Manageability and maintainability:** It provides a single point for maintaining Information & Communication Technology (ICT) infrastructure in India.*
- ***Scalability:** According to the demands from the citizens of India, infrastructure of the government can be increased accordingly.*
- *Efficient service delivery*
- ***Security:** A security framework for the entire GI Cloud will lead to less environmental complexity and less potential vulnerability.*
- *Increased user mobility*
- *Reduced effort in managing technology*
- *Ease of first time IT solution deployment*
- *Cost reduction*
- ***Standardization:** GI Cloud shall prescribe the standards around interoperability, integration, security, data security and portability etc.*

Uses of Meghraj

- The GI Cloud will provide services to government departments, citizens and businesses through internet as well as mobile connectivity.
- In addition to accelerating the delivery of e-services to citizens and businesses, the government's cloud-based service delivery platform will also support a number of other objectives including increased standardization, interoperability and integration, etc.

Main issues of the GI cloud initiative

- lack of common policies among states & center will challenge application reuse
- Individual technology stacks and a lack of infrastructure standardization will limit success.
- The lack of a clear mandate or incentives will affect g-cloud uptake.

Community Radio

- Community radio is a radio service offering a third model of radio broadcasting in addition to commercial and public broadcasting.
- Community stations serve geographic communities and communities of interest. They broadcast content that is popular and relevant to a local, specific audience but is often overlooked by commercial or mass-media broadcasters.
- Community radio stations are operated, owned, and influenced by the communities they serve.
- They are generally non-profit and provide a mechanism for enabling individuals, groups, and communities to tell their own stories, to share experiences, and, in a media-rich world, to become creators and contributors of media.
- In India, the campaign to legitimize community radio began in the mid-1990s, soon after the Supreme Court of India ruled in its judgment of February 1995 that "airwaves are public property".
- The judgment inspired several free speech advocates, academics, and community members across the country to begin a concerted campaign to legitimize community radio in India.
- In December 2002, the Government of India approved a policy for the grant of licenses for setting up of Community Radio Stations to well established educational institutions including IITs/IIMs.
- The matter has been reconsidered and the Government has now decided to broaden the policy by bringing 'Non-profit' organizations like civil society and voluntary organizations etc under its ambit in order to allow greater participation by the civil society on issues relating to development & social change.

Global Centre For Cybersecurity

The centre will focus on the following aims:

- Consolidating existing cybersecurity initiatives of the World Economic Forum
- Establishing an independent library of cyber best practices
- Helping partners to enhance knowledge on cybersecurity
- Working towards an appropriate and agile regulatory framework on cybersecurity
- Serving as a laboratory and early-warning think tank for future cybersecurity scenarios.

Budapest Convention

The Convention on Cybercrime, also known as the Budapest Convention on Cybercrime or the Budapest Convention, is the first international treaty seeking to address Internet and computer crime by harmonizing national laws, improving investigative techniques, and increasing cooperation among nations.

- It was drawn up by the Council of Europe in Strasbourg, France, with the active

नोट – प्रिय IAS उम्मीदवारों, यहाँ हमने इस टॉपिक का मात्र SAMPLE ही दिया है, पूरा टॉपिक नही दिया है / यदि आपको हमारे नोट्स के सैंपल अच्छे लगे हों तो कम्पलीट नोट्स खरीदने के लिए नीचे दिए गये हमारे संपर्क नंबर पर कॉल कीजिए या लिंक पर क्लिक करें / दोस्तों, हमें पूर्ण विश्वास है कि ये नोट्स आपकी "UPSC IAS (PRE. & MAINS)" की परीक्षा में पूर्ण संभव मदद करेंगे और आप "INFUSION NOTES" के साथ IAS की परीक्षा में जरूर सफल होंगे, धन्यवाद /

प्रिय दोस्तों, अब तक हमारे विभिन्न नोट्स में से विभिन्न परीक्षाओं में आये हुए प्रश्नों के परिणाम –

EXAM (परीक्षा)	EXAM DATE	हमारे नोट्स में से आये हुए प्रश्न
RAS PRE. 2021	27 अक्तूबर 2021	74 प्रश्न (150 में से) CUT OFF – 64
UPSC – IAS PRE. (2022)	05 JUNE 2022	69 (100 में से)
SSC GD 2021	16 नवम्बर	68 (100 में से)
SSC GD 2021	01 दिसम्बर	65 (100 में से)
SSC GD 2021	08 दिसम्बर	67 (100 में से)
राजस्थान S.I. 2021	13 सितम्बर	113 (200 में से)
राजस्थान S.I. 2021	14 सितम्बर	119 (200 में से)

राजस्थान S.I. 2021	15 सितम्बर	126 (200 में से)
RAJASTHAN PATWARI 2021	23 अक्टूबर (1st शिफ्ट)	79 (150 में से)
RAJASTHAN PATWARI 2021	23 अक्टूबर (2nd शिफ्ट)	103 (150 में से)
RAJASTHAN PATWARI 2021	24 अक्टूबर (1st शिफ्ट)	95 (150 में से)
RAJASTHAN PATWARI 2021	24 अक्टूबर (2nd शिफ्ट)	91 (150 में से)
RAJASTHAN VDO 2021	27 दिसंबर (1st शिफ्ट)	59 (100 में से)
RAJASTHAN VDO 2021	27 दिसंबर (2nd शिफ्ट)	61 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (1st शिफ्ट)	56 (100 में से)
RAJASTHAN VDO 2021	28 दिसंबर (2nd शिफ्ट)	57 (100 में से)
U.P. SI 2021	14 नवम्बर 2021 1st शिफ्ट	91 (160 में से)
U.P. SI 2021	21नवम्बर2021 (1st शिफ्ट)	89 (160 में से)

& Many More Exams

दोस्तों, इनका proof देखने के लिए नीचे दी गयी लिंक पर क्लिक करें या हमारे youtube चैनल पर देखें –

RAS PRE. – https://www.youtube.com/watch?v=p3_i-3qfDy8&t=136s

VDO PRE. – https://www.youtube.com/watch?v=gXdAk856W18&t=202s

Patwari – https://www.youtube.com/watch?v=X6mKGdtXyu4&t=103s

अन्य परीक्षाओं में भी इसी तरह प्रश्न आये हैं Proof देखने के लिए हमारे youtube चैनल (Infusion Notes) पर इसकी वीडियो देखें या हमारे नंबरों पर कॉल करें।

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Part - 2 Ancient and Medieval History of India

Part - 3 Modern History of India

Part - 4 Art and Culture

Part - 5 Society, World History and Post-Independence India

GENERAL STUDY PAPER – 2

Part -1 Polity, Constitution and Governance

Part - 2 International Relations

Part - 3 Social Justice and Welfare Schemes

GENERAL STUDY PAPER – 3

Part – 1 Economics Part – 1

Part – 2 Economics Part – 2

Part – 3 Science and Technology

Part – 4 Environment, Ecology and Biodiversity

Part – 5 Disaster Management and Internal Security

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Paper – 1 Essay Writing + Current Events & Govt. Schemes

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