



30 Days Revision Module Day 26 - S&T II (UPSC Prelims 2021)

1) Which of the following are the initiatives taken by the Government of India to strengthen the Intellectual Property Rights Regime in India?

1. India's accession to WIPO administered treaties
2. KAPILA scheme by the Ministry of Education
3. SVAMITVA scheme by the Ministry of Panchayati Raj
4. Mission Raksha Gyan Shakti by the Ministry of Defence
5. Signing of Patent Prosecution Highway project with Japan
6. Signing an MoU on Intellectual Property cooperation with the USA

Select the correct answer using the code given below.

- a. 1, 5 and 6 only
- b. 1, 4, 5 and 6 only
- c. 1, 2, 4, 5 and 6 only
- d. 1, 2, 3, 4 and 6 only

Answer : c

- India became the member of 3 WIPO agreements

1. Vienna Agreement
2. Nice Agreement
3. Locarno Agreement

- KAPILA: Kalam Program for IP Literacy and Awareness' which will create appropriate awareness regarding the need of IP amongst students and faculty of higher education institutions.
- SVAMITVA (Survey of villages and mapping with improvised technology in village areas) scheme is a new initiative of the Ministry of Panchayati Raj.
- 'Mission Raksha GyanShakti' aims to provide a boost to the IPR culture in indigenous defence industry.
- The patent offices of India and Japan have inked an agreement for expeditious grant of patents to Indian entities and individuals.
- Department for Promotion of Industry and Internal Trade(DPIIT), has signed a Memorandum of Understanding (MoU) , in the field of Intellectual Property Cooperation with the United States Patent and Trademark Office (USPTO).

2) Consider the following statements:

1. Only the nucleus of the cell is responsible for the transmission of genetic material to the offspring generation.
2. Chromosomes are made up of proteins and nucleic acids.
3. Pentose sugar, phosphoric acid, and nitrogen-based heterocyclic compounds combine to form DNA.
4. DNA contains both Thymine and Uracil while RNA contains only Uracil.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 2 and 3 only
- c. 3 and 4 only
- d. 1, 2, 3 and 4

Answer : b

- Non-nuclear DNA is often inherited uniparentally, meaning that offspring get DNA only from the male or the female parent, not both.
- In humans, for example, children get mitochondrial DNA from their mother, which implies that not just nuclear but also non-nuclear transmission of genetic material is possible.
- Chromosomes are thread-like structures made of proteins and a single molecule of deoxyribonucleic acid (DNA).
- Pentose sugar, phosphoric acid, and nitrogen based heterocyclic compounds combine together to form DNA.
- Though both RNA and DNA contain the nitrogenous bases adenine, guanine and cytosine, RNA contains the nitrogenous base uracil instead of thymine contained in DNA.

DNA - RNA comparison

Characteristic	DNA	RNA
• Monomer	• Nucleotide (P-S-B)	• Nucleotide (P-S-B)
• Sugar	• Deoxyribose	• Ribose
• Bases used	• A,T,C,G	• A,U,C,G
• Usual location	• Nucleus only	• Nucleus AND cytoplasm
• Function	• Carries/transfers genetic info	• Carries/transfers genetic info AND PROTEIN SYNTHESIS
• Structure	• Double strand	• Single strand

3) Which of the following can be developed using Carbon Nano Tubes Technology?

1. A Sensor capable of detecting multidrug-resistant leukaemia cells.
2. Lightweight ballistic resistant jacket.
3. More eco-friendly lithium-ion battery.
4. A technique to separate salt from seawater.
5. Accurate determination of Zinc in soilsamples.

Select the correct answer using the code given below.

- a. 2 only
- b. 1, 2, 4 and 5 only
- c. 1, 2 and 5 only
- d. 1, 2, 3, 4 and 5

Answer : d

- A highly sensitive carbon nanotube-based sensor is capable of detecting multidrug-resistant myeloid leukaemia cells even when present at very low concentration of 10 cells per ml.
- Carbon nanotubes have high strength, light weight and excellent energy absorption capacity and therefore have great potential applications in making antiballistic materials.
- The lithium-ion battery is widely used in the fields of portable devices and electric cars with its

superior performance and promising energy storage applications.

- The unique one-dimensional structure formed by the graphene layer makes carbon nanotubes possess excellent mechanical, electrical, and electrochemical properties and becomes a hot material in the research of lithium-ion battery.
- Scientists have developed carbon nanotubes over 50,000 times thinner than a human hair which can separate salt from seawater, an advance that may help solve the global water crisis.
- A highly sensitive sensor made of fiber coated carbon nanotubes that can detect real-time zinc in the soil even in the presence of other elements and also at minute levels as seen in human sweat.

4) "Synthetic DNA technology" aims at

- a. Altering genetic material outside an organism to obtain desired characteristics
- b. Adding, removing or altering genetic material to be at particular locations in the genome
- c. Creation of self-replicating artificial synthetic cells
- d. Regulation of gene expression in a cell to prevent the expression of a certain gene

Answer : c

- In Synthetic technology, Cells and DNA can be produced artificially.

5) Which of the following statements about Plant-derived Vaccines are correct?

1. It involves the production of vaccine antigens in genetically modified plants.
2. These vaccines are non-infectious and non-replicating.
3. It can be quickly produced in large quantities.
4. It can be produced cheaply in very large amounts.

Select the correct answer using the code given below.

- a. 3 and 4 only
- b. 1 only
- c. 4 only
- d. 1, 2, 3 and 4



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Answer : d

- Plant derived vaccine involves the production of vaccine antigens in genetically modified plants which can then be extracted and purified by conventional methods.
- Such vaccines could either be eaten or applied to mucosal surfaces.
- Traditionally vaccines are prepared by using an attenuated version of the pathogen or by preparing and inactivating a disease-causing organism or a suitable part of it, e.g. a toxin,
- But Plant derived vaccines are non-infectious and non-replicating.
- Compared to traditional methods, which usually take up to six months before a vaccine candidate is identified, the living plant technology is quicker.
- It can be produced cheaply in very high amounts.

6) With reference to the recent advancements in nanotechnology, 'nanomicelle' is more relevant to which of the following application?

- a. As a substitute for an expensive and toxic component used in the electrode of Lithium-Ion Battery
- b. As an Effective drug delivery vehicle without side effects
- c. As Carbon Nano Filters to Convert saltwater to freshwater
- d. Deactivation of virus using radiation

Answer : b

- Nanomicelles are globe-like structures with a hydrophilic outer shell and a hydrophobic interior.

- This dual property makes them a perfect carrier for delivering drug molecules.

7) Scientists at the Institute of Nano Science and Technology, Mohali (Punjab), have produced an ultra-high mobility 2d-electron gas (2DEG).

With reference to the above invention which of the following are the benefits of using electron gas in the field of electronics?

1. Increase information transfer speed in quantum devices
2. Increase data storage and memory of devices
3. Devices do not heat up easily
4. Devices need less input energy to operate

Select the correct answer using the code given below.

- a. 1 only
- b. 2 and 3 only
- c. 2, 3 and 4 only
- d. 1, 2, 3 and 4

Answer : d

- Electron gas with ultra-high mobility can speed up transfer of quantum information and signal from one part of a device to another and increase data storage and memory.
- Since they collide less during their flow, their resistance is very low, and hence they don't dissipate energy as heat.
- So, such devices do not heat up easily and need less input energy to operate.

8) Which of the following are the benefits of Genetic modification:

1. Made crops more tolerant to abiotic stresses
2. Reduced reliance on chemical pesticides
3. Helped to reduce post-harvest losses
4. Increased efficiency of mineral usage by plants

Select the correct answer using the code given below.

- a. 1, 2 and 4 only
- b. 1 and 2 only
- c. 1, 2 and 3 only
- d. 1, 2, 3 and 4

Answer : d

- Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO).
- GM plants have been useful in many ways. Genetic modification has
 1. made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
 2. reduced reliance on chemical pesticides (pest-resistant crops).
 3. helped to reduce post harvest losses.
 4. increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).
 5. enhanced nutritional value of food, e.g., golden rice, i.e., Vitamin 'A' enriched rice.
- In addition to these uses, GM has been used to create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals.

9) Consider the following statements with reference to RNA interference (RNAi):

1. RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression or

translation, by neutralizing targeted mRNA molecules.

2. RNAi is a DNA-dependent gene silencing process.
3. RNAi takes place only in prokaryotic organisms as a method of cellular defence.

Which of the statements given above is/are correct?

- a. 1 only
- b. 1 and 2 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : a

- RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression or translation, by neutralizing targeted mRNA molecules.
- Historically, RNAi was known by other names, including co-suppression, post-transcriptional gene silencing (PTGS), and quelling.
- RNAi takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing).
- Thus RNAi is an RNA-dependent gene silencing process that is controlled by the RNA-induced silencing complex (RISC) and is initiated by short double-stranded RNA molecules in a cell's cytoplasm.

10) With reference to DNA fingerprinting consider the following statements:

1. DNA fingerprinting involves identifying differences in some specific regions in a DNA sequence called repetitive DNA.
2. DNA fingerprinting is the basis of paternity testing, in case of disputes.
3. Polymorphism in a DNA sequence is the basis of genetic mapping of the human genome as well as of DNA fingerprinting.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 2 only
- c. 3 only
- d. 1, 2 and 3

Answer : d

- DNA fingerprinting involves identifying differences in some specific regions in DNA sequence called as repetitive DNA, because in these sequences, a small stretch of DNA is repeated many times.
- These sequences normally do not code for any proteins, but they form a large portion of human genome enabling to identify patterns.
- DNA fingerprinting is very well known for its application in paternity testing in case of disputes. It employs the principle of polymorphism in DNA sequences as the polymorphisms are inheritable from parents to children.
- Polymorphism (variation at genetic level) arises due to mutations. A special type of polymorphism, called VNTR (Variable Number of Tandem Repeats), is composed of repeated copies of a DNA sequence that lie adjacent to one another on the chromosome.
- Since, polymorphism is the basis of genetic mapping of human genome, therefore, it forms the basis of DNA fingerprinting too.

11) With reference to stem cell therapy, consider the following statements

1. It is a type of treatment option that uses a patient's stem cells to repair damaged tissue and repair injuries.
2. Stem cells can be taken only from the bone marrow of the patient's body

3. It is used to treat more than 80 disorders including neuromuscular and degenerative disorders.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 2 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : c

- Stem cell therapy is a type of treatment option that uses a patient's own stem cells to help repair damaged tissue and repair injuries.
- Stem cell therapy, also known as regenerative medicine, promotes the repair response of diseased, dysfunctional or injured tissue using stem cells or their derivatives.
- Stem cells are usually taken from one of two areas in the patient's body: blood and bone marrow or adipose (fat) tissue in their upper thigh/abdomen.
- Because it's common to remove stem cells from areas of stored body fat, some refer to stem cell therapy as "Adipose Stem Cell Therapy" in some cases.
- Stem Cell Therapy (SCT) is the treatment of various disorders, non-serious to life threatening, by using stem cells.
- These stem cells can be procured from a lot of different sources and used to potentially treat more than 80 disorders, including neuromuscular and degenerative disorders.

12) With reference to nanotechnology, consider the following statements:

- 1. Nanoparticles could increase the efficiency of fertilisers.
- 2. Nanotechnology can enable the development of crops that can grow under hostile conditions.
- 3. Nanoparticles are always environmentally friendly.
- 4. All elements become more toxic at nanoscale level.

Which of the statements given above are correct?

- a. 1 and 2 only
- b. 2 and 3 only
- c. 2, 3 and 4 only
- d. None of the above

Answer : a

- A Nano fertilizer is any product that is made with nanoparticles improves nutrient efficiency.
- Nanomaterial coatings (such as a Nano membrane) may slow the release of nutrients or a porous Nano fertilizer may include a network of channels that retard nutrient solubility. Nano fertilizers can increase the efficiency of the fertilizers.
- Nanotechnology is found as most promising approach to improve abiotic-stress tolerance. Thus the crops will have high resilience and could grow even in hostile conditions. Eg: drought stress.
- Nanotechnology contributes significantly to environmental protection by saving reducing the overall energy consumption, raw material required etc. But, there are certain Nano particles which causes harm to the environment.
- Toxicity of nanoparticles depends on their surface properties, coating, structure, size, and ability to aggregate. So, merely the size does not decide the toxicity.

13) Which one of the following statements best describes the term "Synthetic meat" which was seen in the news recently?

- a. It is transgenic meat prepared in the laboratory through the ex-vivo method
- b. Totipotency stem cell culture method is preferred for its growth in labs
- c. It has an enhanced taste and nutrient value than the conventional meat

- d. It increases the carbon footprint by releasing more methane into nature

Answer : a

- Lab-grown meat otherwise called as cultured meat or synthetic meat, is made directly from cells in a laboratory through in vitro cell culture.
- In terms of cellular structure, cultured or cultivated meat is the same as conventional meat — except that cultured meat does not come directly from animals.

14) Consider the following statements with reference to 'Gold Nanoparticles' which sometimes seen in the news recently:

1. They have greater solar radiation absorbing ability than the conventional bulk gold
2. They can be used as a composite therapeutic agent clinical trials in anti-cancer, anti-viral, anti-diabetic, and cholesterol-lowering drugs
3. They do not show any unique optical properties in water

Which of the statements given above is/are correct?

- a. 1 and 3 only
- b. 1 and 2 only
- c. 2 only
- d. 1, 2 and 3

Answer : b

- Nano Particles have been found to impart various desirable properties to different day-to-day products.
- For example, Gold NPs are found to have greater solar radiation absorbing ability than the conventional bulk gold, which makes them a better candidate for use in the photovoltaic cell manufacturing industry.
- Through a study, The National Centre for Polar and Ocean Research (NCPOR) and the Goa University (GU) have established that 20-30-nm-sized spherical-shaped GNPs could be synthesized in a controlled environment.
- These GNPs can be used as composite therapeutic agent clinical trials, especially in anti-cancer, anti-viral, anti-diabetic, and cholesterol-lowering drugs.
- GNPs have unique optical properties too. For example, particles above 100 nm show blue or violet colour in water, while the colour becomes wine red in 100 nm gold colloidal particles. They can thus be used of therapeutic imaging.

15) Consider the following pairs

(Geographical Indication tag)		(State)
1. Sohrai Khovar painting	-	Maharashtra
2. TeliaRumal	-	Telangana
3. Chak-Hao	-	Meghalaya

Which of the pairs given above is/are correctly matched?

- a. 2 only
- b. 2 and 3 only
- c. 1 and 3 only
- d. 1, 2 and 3

Answer : a

- It is traditional and Ritualistic of Jharkhand state.
- Telia Rumal is a intricate handmade work with cotton loom variety of Design. It is the Indication of Telangana state.
- It is a black rice of Manipur region.

16) Consider the following statements about the “Convalescent Plasma Therapy” which sometimes seen in the news recently:

1. It involves the use of plasma from people who have recovered from the infection to aid the immune response of those still fighting it.
2. There are no major side effects with this therapy.
3. It will increase the cytokine storm in the infected person.

Which of the statements given above is/are correct?

- a. 3 only
- b. 2 and 3 only
- c. 1 and 2 only
- d. 1, 2 and 3

Answer : c

- Convalescent plasma therapy uses blood from people who've recovered from an illness to help others recover.
- Some people may have mild complications or none at all. Other people may have severe or life-threatening complications.
- Plasma from healthy donors provides neutralizing antibodies, limiting viral amplification and immunomodulatory effects via the infusion of anti-inflammatory cytokines and antibodies that block complement, inflammatory cytokines, and autoantibodies.

17) The mother's egg is first fertilized with the father's sperm, producing a zygote. The nucleus of the egg or sperm at the stage of fertilization prior to nucleus fusion is then removed from the zygote and inserted into a donor egg that has been fertilized and has had its own nucleus removed. The zygote derived from the donor egg is then implanted into the mother's uterus.

Which of the following technique is explained above?

- a. Pronuclear transfer technique
- b. Maternal spindle transfer technique
- c. Polar body genome transfer
- d. Recombinant DNA technology

Answer : a

- In pronuclear transfer, the mother's egg is first fertilized with the father's sperm, producing a zygote.
- The nucleus of the egg or sperm at the stage of fertilization prior to nucleus fusion is then removed from the zygote inserted into a donor egg.

18) Nanotechnology is being seen as a promising technology for humankind. Which of the following can be the applications of Nanotechnology?

1. Detecting cancer, bacterial and viral infection
2. Controlling antimicrobial resistance
3. Energy storage systems
4. Preservatives for the food processing industry
5. Desalination plants

Select the correct answer using the code given below:

- a. 1, 2 and 3 only
- b. 3, 4 and 5 only
- c. 1, 2, 4 and 5 only
- d. 1, 2, 3, 4 and 5

Answer : d

- Nanomedicine, the application of nanotechnology in medicine, draws on the natural scale of biological phenomena to produce precise solutions for disease prevention, diagnosis, and treatment.
- One of the promising strategies to control antibiotic resistance is the use of nanoparticle (NP) therapeutics, nanostructured coating of indwelling.
- Smaller, faster, and better transistors have been developed that may mean that computer's entire memory may be stored on a single tiny chip.
- In food processing, these nanostructures can be used as food additives, carriers for smart delivery of nutrients, anti-caking agents etc.
- Engineers have developed a thin film membrane with nanopores for energy-efficient desalination.

19) Which of the following medical procedures is/are included in Assisted Reproductive technology?

1. Intra-uterine insemination
2. Surrogacy
3. Sperm donation
4. Cryopreservation

Select the correct answer using the code given below:

- a. 1 and 3 only
- b. 2, 3 and 4 only
- c. 1 only
- d. 1, 2, 3 and 4

Answer : d

- Assisted reproductive technology (ART) includes medical procedures used primarily to address infertility.
- This subject involves procedures such as in vitro fertilization, Intrauterine insemination, intracytoplasmic sperm injection (ICSI), cryopreservation of gametes or embryos, and/or the use of fertility medication.
- Sperm donated are preserved by the sperm banks
- ART may also be used in surrogacy arrangements, although not all surrogacy arrangements involve ART.

20) Consider the following statements with respect to Chak-Hao

1. It is a scented glutinous rice variety popularly known as Black Rice, cultivated widely in Manipur.
2. For the first time in India, the rice variety has been granted Geographical Indication (GI) tag jointly for the seven North-Eastern states of India including Manipur.

Which of the statement(s) given above is/are correct?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

Answer : a

- Incredible India Chak-Hao, scented glutinous rice popularly known as Black Rice which is cultivated in Manipur since centuries and popular to people apart from the State has got GI (Geographical Indications) registration after almost a yearlong battle for registration competing with other States of India.