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SCIENCE MONTHLY

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1. METEORITE SHEDS LIGHT ON SUN'S EARLY LIFE

Why in news?

Analysing a piece of this meteorite and studying the relative abundances of isotopes of lithium, beryllium and boron, two researchers have envisaged how the Sun behaved in its infancy.

What is meteor?

- Meteors are also known as shooting stars.
- They are pieces of dust and debris from space that burn up in Earth's atmosphere, where they can create bright streaks across the night sky.
- When Earth passes through the dusty trail of a comet or asteroid's orbit, the many streaks of light in the sky are known as a meteor shower.
- Particularly large chunks of material can create an extra-bright fireball streak, but most meteors are still small enough to entirely burn up in Earth's atmosphere.
- If a meteor makes it to Earth it's known as a meteorite.
- Before they hit atmosphere the objects are called meteoroids.

What are solar flares?

- A solar flare is an intense burst of radiation coming from the release of magnetic energy associated with sunspots.
- Flares are our solar system's largest explosive events.
- They are seen as bright areas on the sun and they can last from minutes to hours.
- We typically see a solar flare by the photons (or light) it releases, at most every wavelength of the spectrum.
- The primary ways we monitor flares are in x-rays and optical light.
- Flares are also sites where particles (electrons, protons, and heavier particles) are accelerated.

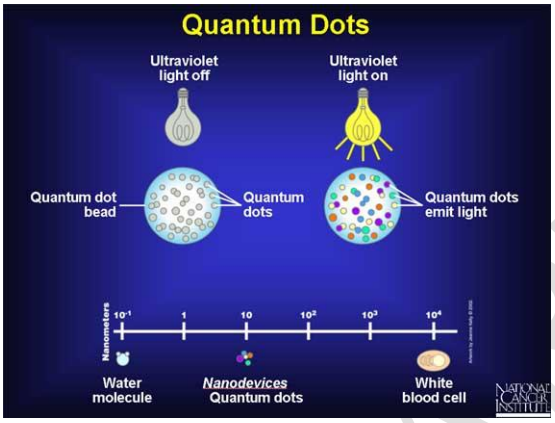
2. QUANTUM THERMOMETER

Why in News?

- Researchers have developed an ultrasensitive quantum thermometer using graphene quantum dots.

What is a Quantum Dot?

- Any material at the nanoscale is a nanoparticle.
- A quantum dot is a nanoparticle made of any semiconductor material such as silicon, cadmium selenide, cadmium sulfide, or indium arsenide.
- Quantum dots may be able to increase the efficiency of solar cells.
- In normal solar cells, a photon of light generates one electron.

- Experiments with both silicon quantum dots and lead sulfide quantum dots can generate two electrons for a single photon of light.
- Therefore, using quantum dots in solar cells could significantly increase their efficiency in producing electric power.
- Researchers are also working on the use of quantum dots in displays like cell phone or television screen that would consume less power than current displays.
- 

- By placing different size quantum dots in each pixel of a display screen, the red, green, and blue colors used to generate the full spectrum of colors would be available.
- Quantum dots are semiconductor nanoparticles that glow a particular color after being illuminated by light.
- The color they glow depends on the size of the nanoparticle.
- When the quantum dots are illuminated by UV light, some of the electrons receive enough energy to break free from the atoms.
- This capability allows them to move around the nanoparticle, creating a conduction band in which electrons are free to move through a material and conduct electricity.
- When these electrons drop back into the outer orbit around the atom (the valence band), they emit light.
- The color of that light depends on the energy difference between the conduction band and the valence band.

3. SECOND LUNAR MISSION OF INDIA TO BE LAUNCHED SOON

Why in News?

Launch of Chandrayaan-2 on July 15

What is the brief history of Chandraayan-1?

- The name Chandrayaan means "Moon Craft" in ancient Sanskrit, according to NASA.
- The Chandrayaan-1 spacecraft was based on an Indian meteorological satellite called Kalpansat.
- Chandrayaan-1 launched on Oct. 22, 2008, from the Satish Dhawan Space Center in Sriharikota, India, aboard a Polar Satellite Launch Vehicle rocket.
- It reached the moon on Nov. 8, 2008.
- Chandrayaan-1 made 3,400 orbits of the moon and continued transmitting data until Aug. 29, 2009, when controllers permanently lost

communication with the spacecraft.

How Chandraayan-2 is planned to be?

- The spacecraft has three major components – orbiter, lander, and rover.
- In the case of Chandrayaan-1, the spacecraft's probe crashed into the Moon's surface and deployed a rover.
- For the sequel, the spacecraft will instead use the lander to make a gentle stop on the lunar surface, and then deploy the rover from there.
- Chandrayaan-2 will be launched to the moon on board the GSLV Mk II.
- ISRO is still currently developing the engine that will help steer and land the Chandrayaan-2 on the Moon.
- The rover will function solely on solar power.
- It will collect rock and soil samples to be analysed and the data it gathers will be transmitted back to Earth.
- The main objective of the mission is to see if ISRO can soft-land a spacecraft on the Moon.
- The Orbiter craft will also conduct mineralogical and elemental studies of the Moon's surface from orbit.
- **Note**: though Roscosmos and ISRO signed an agreement for the two agencies to work together on the Chandrayaan-2 project. Roscosmos withdrew in wake of the failure of the Fobos-Grunt mission to Mars.

4. SPACE DEBRIS OF INDIA DOUBLED

Why in News?

- The amount of Indian space debris may have almost doubled in the aftermath of the Mission Shakti anti-satellite strike but this is still significantly less than the existing space debris generated by China, Russia and the United States.

What are anti-satellite weapons?

- Anti-satellite missiles can be deployed against enemy satellites, disrupting crucial intelligence during war.
- Such a weapon allows for attacks on enemy satellites - blinding them or disrupting communications - as well as providing a technology base for intercepting ballistic missiles.

What is mission Shakti?

- Mission Shakti is an anti-satellite missile test conducted by India.
- This was a technological mission carried out by DRDO.
- The satellite used in the mission was one of India's existing satellites operating in lower orbit.
- With this test, India joins an exclusive group of space faring nations consisting of USA, Russia and China.
- DRDO's Ballistic Missile Defence interceptor was used, which is part of the ongoing ballistic missile defence

programme.

- The test was done in the lower atmosphere to ensure that there is no space debris.

What is space debris?

- Space debris is also called space junk.
- They are artificial material that is orbiting Earth but is no longer functional.
- This material can be as large as a discarded rocket stage or as small as a microscopic chip of paint.
- Much of the debris is in low Earth orbit, within 2,000 km (1,200 miles) of Earth's surface.
- however, some debris can be found in geostationary orbit 35,786 km (22,236 miles) above the Equator.
- As of 2018, the United States Space Surveillance Network was tracking more than 14,000 pieces of space debris larger than 10 cm (4 inches) across.
- It is estimated that there are about 200,000 pieces between 1 and 10 cm (0.4 and 4 inches) across and that there could be millions of pieces smaller than 1 cm.
- How long a piece of space debris takes to fall back to Earth depends on its altitude.
- Objects below 600 km (375 miles) orbit several years before reentering Earth's atmosphere.
- Objects above 1,000 km (600 miles) orbit for centuries.

Why concern about space debris?

- Because of the high speeds (up to 8 km [5 miles] per second) at which objects orbit Earth, a collision with even a small piece of space debris can damage a spacecraft.
- For example, space shuttle windows often had to be replaced because of damage from collisions with man-made debris smaller than 1 mm.
- The amount of debris in space threatens both manned and unmanned spaceflight.

5. EL NINO FACTOR IMPACT THE MONSOON

Why in News?

- Below average monsoon is forecasted in 2019 on the back of a prospective El Nino.

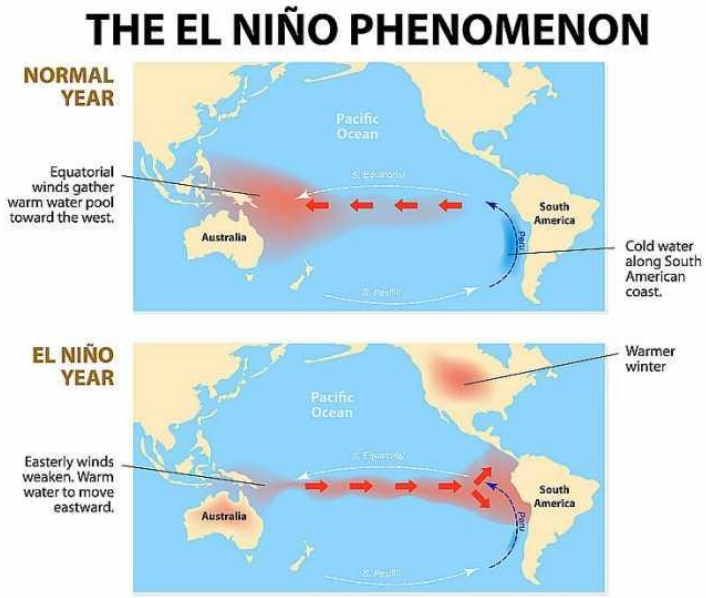
What is ENSO?

- ENSO is nothing but El Nino Southern Oscillation.
- It is an irregular periodic variation of wind and sea surface temperature that occurs over the tropical eastern Pacific Ocean.
- ENSO affects the tropics (the regions surrounding the equator) and the subtropics (the regions adjacent to or bordering the tropics).
- The warming phase of ENSO is called

El Nino, while the cooling phase is known as La Nina.

What is El Nino?

- El Nino is a climatic cycle characterised by high air pressure in the Western Pacific and low air pressure in the eastern.
- In normal conditions, strong trade winds travel from east to west across the tropical Pacific, pushing the warm surface waters towards the western Pacific.



- The surface temperature could witness an increase of 8 degrees Celsius in Asian waters.
- At the same time, cooler waters rise up towards the surface in the eastern Pacific on the coasts of Ecuador, Peru, and Chile.
- This process called upwelling aids in the development of a rich ecosystem.

6. INDIAN SUBCONTINENT'S COLLISION WITH ASIA BOOSTED OXYGEN IN WORLD'S OCEANS

Why in News?

- When the landmass that is now the Indian subcontinent slammed into Asia about 50 million years ago, the oxygen in the world's oceans increased, altering the conditions for life, scientists say.

What is plate tectonics?

- From the deepest ocean trench to the tallest mountain, plate tectonics explains the features and movement of Earth's surface in the present and the past.
- Plate tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, which is a rocky inner layer above the core.
- The plates act like a hard and rigid shell compared to Earth's mantle.
- This strong outer layer is called the lithosphere, which is 100 km (60 miles) thick.
- The lithosphere includes the crust and outer part of the mantle.
- Below the lithosphere is the asthenosphere, which is malleable or partially malleable, allowing the lithosphere to move around.

How many plates are there?

- There are nine major plates.
- These plates are named after the landforms found on them.
- The nine major plates are North American, Pacific, Eurasian, African, Indo-Australian, Australian, Indian, South American and Antarctic.
- The largest plate is the Pacific Plate.
- Most of it is located under the ocean.
- There are also many smaller plates throughout the world.

What are the different plate boundaries?

- A divergent boundary occurs when two tectonic plates move away from each other.
- Along these boundaries, lava spews from long fissures and geysers spurt superheated water.
- Frequent earthquakes strike along the rift.
- When two plates come together, it is known as a convergent boundary.
- The impact of the two colliding plates buckles the edge of one or both plates up into a rugged mountain range, and sometimes bends the other down into a deep seafloor trench.
- Two plates sliding past each other forms a transform plate boundary.
- Natural or human-made structures that cross a transform boundary are offset—split into pieces and carried in opposite directions.
- Rocks that line the boundary are pulverized as the plates grind along, creating a linear fault valley or undersea canyon.

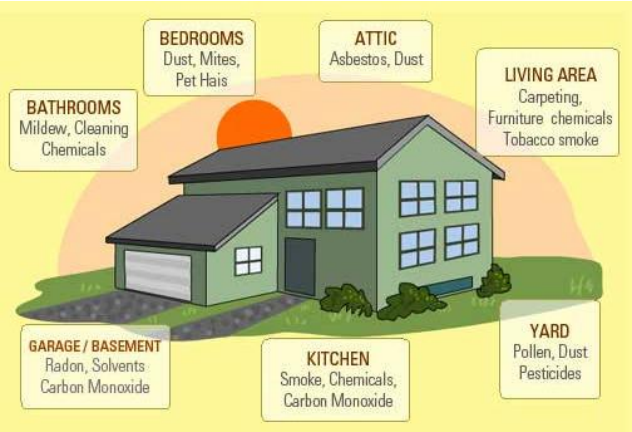
7. INDOOR AIR POLLUTION

Why in News?

- Indoor air pollution accounted for 40% of PM 2.5 pollution in the Gangetic basin.

What is indoor air pollution?

- Indoor air pollution is the degradation of indoor air quality by harmful chemicals and other materials.
- It can be up to 10 times worse than outdoor air pollution.
- This is because contained areas enable potential pollutants to build up more than open spaces.
- Statistics suggest that in developing countries, health impacts of indoor air pollution far outweigh those of outdoor air pollution.



What are the sources of indoor air pollution?

- Sources of indoor pollution include

Mold and pollen

- Tobacco smoke
- Household products and pesticides
- Gases such as radon and carbon monoxide
- Materials used in the building such as asbestos, formaldehyde and lead

What is national clean air programme?

- It is a pollution control initiative
- It was launched by the Ministry of Environment
- Its aim is to cut the concentration of coarse (particulate matter of diameter 10 micrometer or less, or PM10) and fine particles (particulate matter of diameter 2.5 micrometer or less, or PM2.5) by at least 20% in the next five years, with 2017 as the base year for comparison.

8. OVER A MILLION DIES OF AIR POLLUTION

Why in News?

Study claims poor air quality caused 1.2 mn deaths each in India and China in 2017

What is the means of measurement of air quality index in India?

- SAFAR stands for System of Air Quality and Weather Forecasting And Research
- It is a research program to build Air-Pollution mitigation strategies in consonance with nation's economic development
- It is launched in greater metropolitan cities of India to provide location specific information on air quality in near real time
- It has been combined with the early warning system on weather parameters
- The ultimate objective of the project is to increase awareness among general public regarding the air quality in their city well in advance.
- It was developed indigenously by Indian Institute of Tropical Meteorology (IITM), Pune and operationalized by India Meteorological Department (IMD).
- Pollutants monitored: PM1, PM2.5, PM10, Ozone, CO, NOx (NO, NO2), SO2, BC, Methane (CH4), Non-methane hydrocarbons (NMHC), VOC's, Benzene, Mercury.
- Meteorological Parameters: UV Radiation, Rainfall, Temperature, Humidity, Wind speed, Wind direction, sola

9. PLATINUM DEPENDENCY OF FUEL CELL

Why in News?

- Researchers observe new promising methods to reduce platinum dependency for hydrogen production in fuel cells.

What is a Fuel Cell?

- A fuel cell is a device that generates electrical power through a chemical reaction by converting a fuel (hydrogen) into electricity.
- Although fuel cells and batteries are both considered electrochemical cells and consist of similar structure.
- Fuel cells require a continuous source of fuel and oxygen to run.
- Similar to how an internal combustion engine needs a continuous flow of gasoline or diesel.
- A PEM (Proton Exchange Membrane) cell uses hydrogen gas (H_2) and oxygen gas (O_2) as fuel.
- The products of the reaction in the cell are water, electricity, and heat.
- This is a big improvement over internal combustion engines, coal burning power plants, and nuclear power plants, all of which produce harmful by-products.
- Since O_2 is readily available in the atmosphere, we only need to supply the fuel cell with H_2 which can come from an electrolysis process

What are the basic elements of a PEM Fuel Cell:

- The anode, the negative: It conducts the electrons that are freed from the hydrogen molecules so that they can be used in an external circuit.
- The cathode, the positive: It also conducts the electrons back from the external circuit to the catalyst, where they can recombine with the hydrogen ions and oxygen to form water.
- The electrolyte is the proton exchange membrane.
- The membrane blocks electrons.
- For a PEMFC, the membrane must be hydrated in order to function and remain stable.
- The catalyst is a special material that facilitates the reaction of oxygen and hydrogen.
- It is usually made of platinum nanoparticles very thinly coated onto carbon paper or cloth.
- The catalyst is rough and porous so that the maximum surface area of the platinum can be exposed to the hydrogen or oxygen.
- The platinum-coated side of the catalyst faces the PEM.
- The heart of the cell is the proton exchange membrane.
- It allows protons to pass through it virtually unimpeded, while electrons are blocked.

10. DUBNIUM

Why in News?

Both the Soviet Joint Institute of Nuclear Research and the American Lawrence Berkeley Laboratory laid claim to the discovery of dubnium around the same time.

What are transuranium elements?

- Transuranium element are any of the chemical elements that lie beyond uranium in the periodic table—i.e., those with atomic numbers greater than 92.
- Twenty-six of these elements have been discovered and named or are awaiting confirmation of their discovery.
- Eleven elements, from neptunium through lawrencium, belong to the actinoid series.
- The others, which have atomic numbers higher than 103, are referred to as the transactinoids.
- All the transuranium elements are unstable, decaying radioactively, with half-lives that range from tens of millions of years to mere fractions of a second.
- All transuranium elements must be produced artificially.

What are the most recently discovered elements?

- nihonium (Nh) - 113,
- moscovium (Mc) - 115,
- tennessine (Ts) - 117, and
- oganesson (Og) – 118

11. AYUSH

Why in News?

- The Ministry of AYUSH has issued an advisory asking all non-AYUSH researchers and institutions to "involve appropriate expert/ institution/ research council of AYUSH" while carrying out any "scientific study, clinical trial or intervention" using AYUSH drug or treatment.

What is AYUSH?

- AYUSH is an acronym that is used to refer to the non-allopathic medical systems in India.
- It includes the Indian medical system of Ayurveda, Yoga, Unani, Siddha, and also Homeopathy.
- In the current terminology of the Ministry of Health in India, non-allopathic doctors are now referred to as AYUSH (meaning "life" in Sanskrit) doctors.
- Department of Indian Systems of Medicine and Homoeopathy (ISM&H) was created in March,1995.
- It was re-named as Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) in November, 2003 with a view to providing focused attention to development of Education &

Research.

What is Ayurveda?

- The word Ayurveda derived from *AYU* and *VEDA*.
- *AYU* means life *VEDA* means science or knowledge.
- Ayurveda means the science of life.
- It is amply clear that Ayurveda is not only a system of medicine but also a way of life for complete positive health and spiritual attainments.
- Ayurveda embraces all living things, animate and inanimate.
- Ayurveda believes that positive health is the basis for attaining four cherished goals of life (*chaturvidh purushartha*) viz., Dharma, Artha, Kama, Moksha.

What are the branches of ayurveda?

- It is divided into three main branches viz.,
- Nara Ayurveda dealing with human life
- Satva Ayurveda the science dealing with animal life and its diseases,
- Vriksha Ayurveda the science dealing with plant life, its growth and diseases.

What is yoga?

- The word 'yoga' is derived from the Vedic Sanskrit root word 'yuj', which means 'to unite', or 'to join'.
- Yoga may have begun earlier than the sixth or 7th century BC but most believe it began in the Vedic period (1700-500 BC).
- A yogi is a male person who practices yoga.
- A yogini is a female person who practices yoga.
- The main types of yoga are Raja yoga and Hatha yoga.
- Yoga teaches that there are seven chakras (energy centers) in the body. These eight chakras include sahasrara (crown chakra), anja (third eye chakra), vishudda (throat chakra), anahata (heart chakra), manipura (naval chakra), svadhisthana (pelvic or sacral chakra), and mooladhara (root chakra).
- Yoga can increase flexibility, help in detoxification, increase weight loss, and improve physical fitness.

What is Unani Treatment?

- Unani treatment originated from Greece (Unan).
- It aims to aid body's natural processes with medicines that have no side effects.
- Unani is known by many different names, Greco-Arabs medicine, Arab medicine, Ionian medicine and Oriental medicine.
- According to Unani system, diseases are natural processes and the

symptoms are body's reaction to them.

- Human body has self-preservation power (Quwwat-e-Mudabbira) that maintains the balance of these humours.
- Unani treatment facilitates body to regain or strengthen this balance.

What is Siddha?

- Siddha system is one of the oldest systems of medicine in India.
- The term 'Siddha' means achievements and 'Siddhars' were saintly persons who achieved results in medicine.
- Eighteen Siddhars were said to have contributed towards the development of this medical system.
- Siddha literature is in Tamil and it is practised largely in Tamil speaking part of India and abroad.
- The Siddha System is largely therapeutic in nature.

GI tag for Erode's Turmeric

Why in News?

- Erode's unique slender turmeric gets a GI tag for its distinctive fragrance and colour.

What is a geographical indication?

- A geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin.
- In order to function as a GI, a sign must identify a product as originating in a given place.
- In addition, the qualities, characteristics or reputation of the product should be essentially due to the place of origin.
- Since the qualities depend on the geographical place of production, there is a clear link between the product and its original place of production.
- **Why GI tag?**
- It supports local production and helps in mainstreaming and upliftment of the rural and the tribal communities.
- These GI tags must not be confused with IPR.
- GI is a collective right, unlike IPRs which grants protection to individual interest.
- GI recently got a logo and a tagline given by the Commerce and Industry Minister to increase the awareness about the IPRs in the country.
- GI list over the past couple of years (2017-2019 Feb)

S.No.	Name	Commodity/handicraft/food item	Place
1	Alphonso	Food	Konkan (Western Indian states of Maharashtra, Goa, and the South Indian state of Karnataka)
2	Kadaknath chicken	Food (meat)	Madhya Pradesh
3	Shahi litchi	food	Bihar
4	Patola Sarees	Handicraft	RajKot (Gujrat)
5	Boka Chaul	food	Assam
6	Katarni Rice	food	Bihar
7	Pethapur Printing Blocks	Handicraft/textile making	Gujarat
8	Tulapanji rice	food	Bengal
9	Pochampally Ikat	Handicraft	Telangana
10	Durgi Stone Carvings	Handicraft	Guntur District (Andhra Pradesh)
11	Chakshesang Shawl	Handicraft	Nagaland
12	Etikoppaka Toys	Handicraft	Andhra Pradesh
13	Sangli Turmeric	Food item	Maharashtra

12. BIOMARKERS

Why in News?

- A study has found that it is now possible to tell in advance if a person with oral cancer of the gum and cheek has lymph node metastasis even before surgery is undertaken.

What are biomarkers?

- Biomarkers are molecules that indicate normal or abnormal process taking place in your body and may be a sign of an underlying condition or disease.
- Various types of molecules, such as DNA (genes), proteins or hormones, can serve as biomarkers, since they all indicate something about your health.
- Biomarkers may be produced by the cancer tissue itself or by other cells in the body in response to cancer.
- They can be found in the blood, stool, urine, tumor tissue, or other tissues or bodily fluids.
- Notably, biomarkers are not limited to cancer.
- There are biomarkers for heart disease, multiple sclerosis, and many other diseases.

What are the uses of Biomarkers?

Medical use of Biomarkers

- Biomarkers can be used to find out:
- what will happen to you when you use a particular treatment
- or don't use the treatment and
- the risk of you developing certain medical conditions.

Diagnostic use of Biomarkers

- An example of a diagnostic use of biomarkers is the measurement of biomarkers in blood to tell if you've had a heart attack.
- Measuring the levels of enzymes, hormones and proteins in your blood enables a doctor to determine the severity of your heart attack and how much damage your heart has suffered.

What is Cancer?

- Cancer is the uncontrolled growth of abnormal cells anywhere in a body.
- There are over 200 types of cancer.
- Anything that may cause a normal body cell to develop abnormally potentially can cause cancer.
- General categories of cancer-related or causative agents are as follows: chemical or toxic compound exposures, ionizing radiation, some pathogens, and human genetics.
- Although there are many tests to screen and presumptively diagnose cancer, the definite diagnosis is made by examination of a biopsy sample of suspected cancer tissue.

- Cancer staging is usually determined by numbering it from 1 to 4.
- Most treatments include at least one of the following and may include all: surgery, chemotherapy, and radiation therapy.

What is Metastasis?

- Metastasis means that cancer spreads to a different body part from where it started.
- It is also called "metastatic cancer," "advanced cancer," or "stage 4 cancer."
- For example, a cancer that is large but has not spread to another body part can also be called advanced cancer or locally advanced cancer.

13. CHINA TOUGH ON EMBRYO TRIALS

Why in News?

- China's top legislature will consider tougher rules on research involving human genes and embryos

What is an Embryo?

- An embryo is an early stage of development for an unborn baby.
- During this period of growth, a tiny fertilized egg divides and develops to a point where it starts to resemble a newborn.

What are the stages of development of an embryo?

Zygote

- It started out as a single fertilized egg called a **zygote**
- Fertilization happens when a female egg is joined by a male sperm.

Embryo

- After fertilization, zygote is moved into first major stage of development, and referred as an **embryo**.
- Changing from a zygote to an embryo is all about dividing, or more specifically, cell division.
- Fertilization takes place in the uterine tubes, which are tubes that connect the female ovaries to the uterus.
- The ovaries are where the eggs came from, and the uterus is where the embryo implants, or sits as it grows.
- When the embryo first arrives in the uterus, it is a tiny cluster of cells.

Growth in the Uterus

- At this point, the still tiny embryo needs a place to rest and grow, so it burrows into the lining of the mother's uterus, which is called the endometrium.
- The endometrium is a safe place for the embryo to develop and have its needs met.

14. ENDOGAMY - A MAJOR CAUSE OF INFERTILITY

Why in News?

- Study finds endogamy can be a major cause of infertility in Indian men.

What is a cell?

- Cells are the basic building blocks of all living things.
- Cells also contain the body's hereditary material and can make copies of themselves.
- Cells have many parts, each with a different function.
- Some of these parts, called organelles, are specialized structures that perform certain tasks within the cell.

What is a chromosome?

- In the nucleus of each cell, the DNA molecule is packaged into thread-like structures called chromosomes.
- Each chromosome is made up of DNA tightly coiled many times around proteins called histones that support its structure.
- Chromosomes are not visible in the cell's nucleus—not even under a microscope—when the cell is not dividing.
- However, the DNA that makes up chromosomes becomes more tightly packed during cell division and is then visible under a microscope.
- Most of what researchers know about chromosomes was learned by observing chromosomes during cell division.

What is DNA?

- DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms.
- Nearly every cell in a person's body has the same DNA.
- Most DNA is located in the cell nucleus (where it is called nuclear DNA), but a small amount of DNA can also be found in the mitochondria (where it is called mitochondrial DNA or mtDNA).
- Mitochondria are structures within cells that convert the energy from food into a form that cells can use.

What are some of the important chromosomal disorders?

Syndrome	*Abnormality*
• Down's	• Trisomy 21
• Edwards'	• Trisomy 18
• Patau's	• Trisomy 13
• Turner	• Monosomy X

Genome sequencing to map population diversity

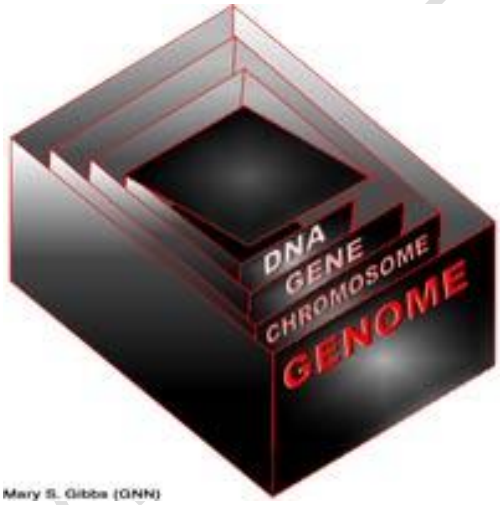
Why in News?

- In an indigenous genetic mapping effort, nearly 1,000 rural youth from the length and breadth of India will have their genomes sequenced by the

Council of Scientific and Industrial Research (CSIR).

What are Genome, Gene and DNA?

- A gene is the basic physical and functional unit of heredity.
- Genes are made up of DNA.
- Some genes act as instructions to make molecules called proteins.
- In most living things, the genome is made of a chemical called DNA.
- The genome contains genes, which are packaged in chromosomes and affect specific characteristics of the organism.
- The genome is divided into chromosomes, chromosomes contain genes, and genes are made of DNA.



What is Genome sequencing?

- Genome sequencing is figuring out the order of DNA nucleotides, or bases, in a genome—the order of As, Cs, Gs, and Ts that make up an organism's DNA.
- The human genome is made up of over 3 billion of these genetic letters.
- The rules of base pairing (or nucleotide pairing) are:
    - A with T: the purine adenine (A) always pairs with the pyrimidine thymine (T)
    - C with G: the pyrimidine cytosine (C) always pairs with the purine guanine (G)

15. ILLEGAL GROWING OF GM BRINJAL

Why in News?

- Genetically modified (GM) brinjal is being illegally grown in the Fatehabad district of Haryana, according to anti-GM activists.

What are genetically modified (GM) organisms and GM foods?

- Genetic modification is the process of altering the genetic makeup of an organism.
- This has been done indirectly for thousands of years by controlled, or selective, breeding of plants and animals.
- Modern biotechnology has made it easier and faster to target a specific gene for more-precise alteration of the organism through genetic engineering.
- Genetically modified organisms (GMOs) can be defined as organisms

in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination.

- The technology is often called "modern biotechnology" or "gene technology", sometimes also "recombinant DNA technology" or "genetic engineering".
- It allows selected individual genes to be transferred from one organism into another, also between nonrelated species.
- Foods produced from or using GM organisms are often referred to as GM foods.

What are the primary methods of genetically modifying crops?

- **Selective breeding**: Two strains of plants are introduced and bred to produce offspring with specific features. Between 10,000 and 300,000 genes can be affected. This is the oldest method of genetic modification, and is typically not included in the GMO food category.
- **Mutagenesis**: Plant seeds are purposely exposed to chemicals or radiation in order to mutate the organisms. The offspring with the desired traits are kept and further bred. Mutagenesis is also not typically included in the GMO food category.
- **RNA interference**: Individual undesirable genes in plants are inactivated in order to remove any undesired traits.
- **Transgenics**: A gene is taken from one species and implanted in another in order to introduce a desirable trait.

16. OIL CONSUMING BACTERIA FOUND AT SEA BOTTOM

Why in News?

Scientists have discovered a unique oil eating bacteria in the Mariana Trench, the deepest part of the earth's oceans, a finding that may pave way for sustainable ways to clean up oils spills.

What is Bioremediation?

- Bioremediation is the application of a biological treatment, mainly microbes, to the cleanup hazardous contaminants in soil and surface or subsurface waters.
- These microorganisms can be used to transform them to less harmful forms.
- The bacteria feed on the contamination, deriving nutrition for growth and for reproduction.
- The microbes will survive and consume their contaminant food source until the unwanted pollutant is remediated.
- **What is Bioaugmentation?**
- Bioaugmentation is a process where selected, standardized bacteria (microbes) are added to an area that

has been contaminated with an unwanted substance.

- These bacteria break down the contaminants.
- Scientific advances have enabled us to isolate and mass-produce standardized pro-biotic bacteria and fungi into industrial concentrated inoculum's.
- These selected formulations, of multiple strains of bacteria, can be targeted to address specific contaminants.

17. RESURGENCE OF MEASLES

Why in News?

The resurgence of the once-eradicated, highly-contagious disease (Measles in US) is linked to a growing anti-vaccine movement in richer nations — which the World Health Organization has identified as a major global health threat.

What is measles?

- Measles is a viral disease.
- It can spread rapidly.
- It is also known as rubeola or morbilli.
- Measles is an endemic disease, meaning it is continually present in a community, and many people develop resistance.
- It is an unpleasant condition but one that normally passes without treatment within 7 to 10 days.
- After a bout of measles, a person gains immunity for the rest of their life.
- They are very unlikely to contract measles a second time.

What are the Symptoms of Measles?

- Measles is often noticed through a breakout of spots.
- The symptoms of measles always include fever and at least one of the three Cs:
- cough
- coryza, or runny nose
- conjunctivitis
- Symptoms may include:
- runny nose
- dry hacking cough
- conjunctivitis, or swollen eyelids and inflamed eyes
- watery eyes
- photophobia, or sensitivity to light
- sneezing
- a reddish-brown rash
- Koplik's spots, or very small grayish-white spots with bluish-white centers in the mouth, insides of cheeks, and throat
- generalized body aches

18. ZINC DEFICIENCY RISING IN INDIANS

Why in News?

- A new study cautions rising carbon dioxide levels can accelerate zinc deficiency in crops and thus in human consumption.

What is zinc?

- Zinc is the 24th most common element in the planet's crust.
- It makes up approximately seventy-five parts per million, or .0075%, of the Earth's crust.
- Zinc is also found in Earth's seawater, at around thirty parts per billion.
- Zinc is usually found with other elements like copper.
- It has five naturally occurring stable isotopes.
- The most common stable isotope of zinc is Zn-64.
- Zn-64 has such a long half-life that it radioactive properties are virtually non-existant.
- Zinc is used in the production of brass, where it's alloyed with copper, and many other alloys.
- It is also used in plating iron, due to its non-corrosive properties.
- Zinc is a hard metal, but becomes very malleable above 100 degrees Celsius.
- Of all the transition metals, it has the lowest melting point after cadmium and mercury.
- Zinc is considered to be a fairly strong reducing agent, and tarnishes very quickly.
- Zinc burns with a very bright blue-green flare.
- Zinc compounds are not very abundant.
- After copper, aluminium, and iron, zinc is the most commonly used metal by industry.
- Zinc production today is from nearly 70% mining and 30% recycling.
- Almost all zinc (95%) is mined from sulfide ore deposits.

What does zinc do in the body?

- Helps cells divide and promote wound healing.
- supports cell function, helping an estimated 100 enzymes — molecules that make chemical reactions happen — perform their duties.
- plays additional roles in the body, including:
    - boosting immune function
    - helping cells divide
    - maintaining the sense of smell and taste
    - promoting wound healing
- Zinc also supports a person's growth and development. As such, it is an essential mineral for pregnant women

as well as growing children.

- A person's body does not store zinc, which means getting enough of the mineral from food is important in preventing a deficiency.

What are the Symptoms of zinc deficiency?

- Symptoms of zinc deficiency tend to be linked to the roles that zinc performs in the body.
- Some of the most common zinc deficiency symptoms include:
    - appetite loss
    - slower than expected growth
    - poor immune system function
- Severe zinc deficiency can cause even more concerning symptoms. Examples include:
- delayed sexual maturity
- diarrhea
- eye and skin lesions
- feeling lethargic
- funny-taste sensations
- hair loss
- poor wound healing
- unexplained weight loss
- Men and boys can also experience impotence and hypogonadism, which is when a male's body does not produce enough testosterone.

19. BIOSIMILARS

Why in News?

- Centre for Cellular & Molecular Biology (CCMB) has joined hands with the Ghaziabad-based Indian Pharmacoepia Commission (IPC) to facilitate regulatory process for biosimilars and herbal drugs.

What are Biologics?

- Biological products are medicines made from living organisms.
- It is manufactured through highly complex manufacturing processes and must be handled and administered under carefully monitored conditions.
- Biologics include a wide variety of products such as gene and cell therapies, therapeutic proteins, monoclonal antibodies, and vaccines.
- Biologics are used to prevent, treat or cure a variety of diseases including cancer, chronic kidney disease, diabetes, cystic fibrosis, and autoimmune disorders.

What are biosimilars?

- A biosimilar is a biologic that is "similar" to another biologic medicine (known as a reference product).
- Biosimilars are highly similar to the reference product in terms of safety, purity and potency, but may have minor differences in clinically inactive components.