



# IAS PARLIAMENT

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A Shankar IAS Academy Initiative

## SCIENCE MONTHLY

NOVEMBER 2019

**Shankar IAS Academy™**

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## SCIENCE & TECHNOLOGY

NOVEMBER 2019

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## SCIENCE & TECHNOLOGY

### NOVEMBER 2019

#### 1. SPACE

##### 1.1 A Rare Tansit of Mercury

###### Why in News?

On November 11, the planet of Mercury skipped across the vast, glaring face of the sun in a rare celestial transit.

###### What are the facts about mercury?

- Mercury is nearly tidally locked to the Sun – also known as a gravitational lock.
- Over time this has slowed the rotation of the planet to almost match its orbit around the Sun.
- It is one of five planets that are visible to the naked eye.
- After the Earth, Mercury is the second densest planet.
- Mercury has no moons or rings
- Mercury is only the second hottest planet.
- The orbit of Mercury was important in proving Albert Einstein’s theory of General Relativity.
- Mercury has a very thin atmosphere.
- Only two spacecraft have ever visited Mercury: they are Mariner 10 and Messenger.

##### 1.2 Astrosat Views Star Formation in Jellyfish Galaxies

###### Why in News?

Observations of a jelly fish galaxy, JW100, by Astrosat using its Ultraviolet Imaging Telescope have thrown up interesting puzzles.

###### What is Galaxy?

- A **galaxy** is a huge collection of gas, dust, and billions of stars and their solar systems.
- A galaxy is held together by gravity.
- Our galaxy, the Milky Way, also has a supermassive black hole in the middle.

###### What are the types of galaxies?

- There are three main types of galaxies: Elliptical, Spiral, and Irregular.
- Two of these three types are further divided and classified into a system that is now known the tuning fork diagram.

###### Spiral galaxies:

- Spiral galaxies are the most common type in the universe.
- Our Milky Way is a spiral, as is the rather close-by Andromeda Galaxy.
- Spirals are large rotating disks of stars and nebulae, surrounded by a shell of dark matter.
- The central bright region at the core of a galaxy is called the “galactic bulge”.
- Many spirals may also contain supermassive black holes in their cores.

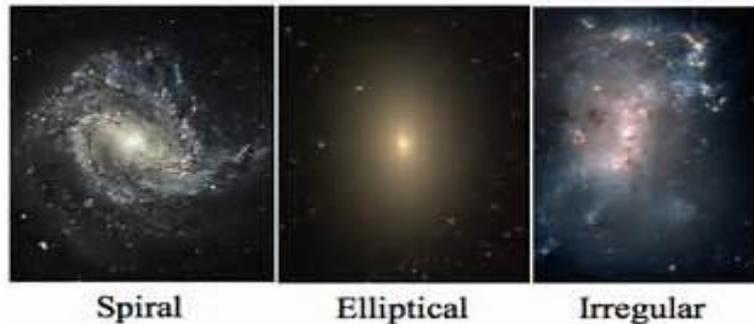
###### Elliptical Galaxies

- Elliptical galaxies are roughly egg-shaped (ellipsoidal or ovoid) found largely in galaxy clusters and smaller compact groups.
- Most ellipticals contain older, low-mass stars, and lack a great deal of star-making gas and dust clouds.
- Therefore there is little new star formation occurring in them.
- Messier 87 is an example of an elliptical galaxy.

###### Irregular Galaxies

- Irregular galaxies are as their name suggests: irregular in shape.

- The best example of an irregular that can be seen from Earth is the Small Magellanic Cloud.



### 1.3 Cartosat-3 Launched

#### Why in News?

Isro launched advanced earth imaging and mapping satellite CARTOSAT-3 along with 13 other commercial nano-satellites

#### What is Cartosat-3

- CARTOSAT-3 is a third-generation agile satellite with high-resolution imaging capabilities.
- The satellite will replace the IRS series, according to Isro.
- The CARTOSAT-3 has a panchromatic resolution of 0.25 metres, which helps it conduct satellite imaging with the highest resolution.
- The space research organisation said this mission is a huge leap from the previous payloads in the CARTOSAT series.
- The CARTOSAT-3, with an overall mass of over 1,600 kilograms, will address the increased user demand for large-scale urban planning, rural resource and infrastructure development, coastal land use and land cover.
- The mission life of CARTOSAT-3 would be for five years, said the space research organisation.

### 1.4 Monster Black Hole Discovered

#### Why in News?

The astronomers discover black hole 70 times bigger than Sun

Located 15,000 light-years from Earth and has been named LB-1 by the researchers at National Astronomical Observatory of China.

#### What Is a Black Hole?

- A black hole is a place in space where gravity pulls so much that even light cannot get out.
- The gravity is so strong because matter has been squeezed into a tiny space.
- This can happen when a star is dying.
- Because no light can get out, people can't see black holes.
- They are invisible.
- Space telescopes with special tools can help find black holes.
- The special tools can see how stars that are very close to black holes act differently than other stars.
- Sagittarius A\* is the black hole at the center of the Milky Way galaxy.

#### How Do Scientists Know They Are There?

- A black hole cannot be seen because strong gravity pulls all of the light into the middle of the black hole.
- But scientists can see how the strong gravity affects the stars and gas around the black hole.
- Scientists can study stars to find out if they are flying around, or orbiting, a black hole.

- When a black hole and a star are close together, high-energy light is made.
- This kind of light cannot be seen with human eyes.
- Scientists use satellites and telescopes in space to see the high-energy light.

## 1.5 Voyager 2

### Why in News?

NASA's Voyager 2 becomes second spacecraft to reach interstellar space.

### What is Voyager 2?

- NASA's Voyager 2 is the second spacecraft to enter interstellar space.
- On Dec. 10, 2018, the spacecraft joined its twin—Voyager 1—as the only human-made objects to enter the space between the stars.
- Voyager 1 and 2 were designed to take advantage of a rare planetary alignment to study the outer solar system up close.
- Voyager 2 targeted Jupiter, Saturn, Uranus and Neptune.
- Like its sister spacecraft, Voyager 2 also was designed to find and study the edge of our solar system.

### What is heliopause?

Scientists define the beginning of interstellar space as the place where the Sun's constant flow of material and magnetic field stop affecting its surroundings. This place is called the heliopause.

### How would we know when we've arrived in interstellar space?

- When it comes to the sun it's all about detecting the concentration and temperature of the particles around you.
- Inside the heliosphere, the solar particles are hot but less concentrated.
- Outside of the bubble, they are very much colder but more concentrated.
- Once you arrive in interstellar space, there would be an increase of "cold" particles around you.
- There would also be a magnetic field that does not originate from our sun.

## 1.6 Carbon Offsetting and Carbon Credits

### What is offsetting and why is it a tricky topic?

- Carbon offsetting allows a country to help reach its own emissions reduction targets by funding emission reductions in another country.
- Companies are also increasingly using carbon credits to offset their emissions.
- The first major offsetting scheme, the U.N.s clean development mechanism (CDM), was set up under the 1997 Kyoto Protocol, in which 190 countries agreed country-by-country emission reduction targets.
- The scheme was designed to help fund emission reduction projects in developing countries, while also providing offset credits to the developed world to help meet its Kyoto targets.

### What is a Carbon Credit?

- A carbon credit is a permit or certificate allowing the holder, such as a company, to emit carbon dioxide or other greenhouse gases.
- The credit limits the emission to a mass equal to one ton of carbon dioxide.
- The ultimate goal of carbon credits is to reduce the emission of greenhouse gases into the atmosphere.

## 2. ENVIRONMENT

### 2.1 Air Pollution increasing Glaucoma

#### Why in News?

Report says that neighbourhoods with higher amounts of fine particulate matter pollution were at least 6% more likely to report having glaucoma than those in the least-polluted areas.

#### What is Glaucoma?

- Glaucoma is a group of eye conditions that damage the optic nerve, the health of which is vital for good vision.
- This damage is often caused by an abnormally high pressure in your eye.
- Glaucoma is one of the leading causes of blindness for people over the age of 60.
- It can occur at any age but is more common in older adults.
- Many forms of glaucoma have no warning signs.
- Because vision loss due to glaucoma can't be recovered, it's important to have regular eye exams that include measurements of your eye pressure so a diagnosis can be made in its early stages and treated appropriately.
- If glaucoma is recognized early, vision loss can be slowed or prevented.
- If you have the condition, you'll generally need treatment for the rest of your life.

#### What is Particulate Matter?

- "Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets.
- Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.
- The size of particles is directly linked to their potential for causing health problems.

### 2.2 Climate Emergency

#### Why in News?

UN Annual Assessment on greenhouse gases calls for 7.6% cut each year.

#### What are the findings of the study?

- The United Nations Environment Programme said that global emissions need to fall by 7.6% each year until 2030 to limit global temperature rises to 1.5°C.
- Emissions have risen on average 1.5% annually over the last decade.
- Recorded 55.3 billion tonnes of carbon dioxide or equivalent greenhouse gases in 2018 — three years after 195 countries signed the Paris treaty on climate change.
- The World Meteorological Organization said that atmospheric greenhouse gas concentrations hit an all-time record in 2018.
- The Paris deal committed nations to limit temperature rises above pre-industrial levels to “well below” 2C, and to a safer 1.5-C if at all possible.
- To do so they agreed on the need to reduce emissions and work towards a low-carbon world within decades.
- Even if every country made good on its promises, Earth’s “carbon budget” for a 1.5-C rise -- the amount we can emit to stay below a certain temperature threshold -- would be exhausted within a decade.
- While it insisted the 1.5°C goal is still attainable, it acknowledged that this would require an unprecedented, coordinated upheaval of a global economy that is still fuelled overwhelmingly by oil- and gas-fuelled growth.

## 2.3 Eco-Anxiety

### What is eco-anxiety?

- The feeling of being overwhelmed by the challenges of climate change and the fear about the state of the environment.
- It is the helplessness that makes us see ourselves as just one insignificant entity on the planet, unable to reverse the crisis.
- It is also the sense that no matter how hard we work, nothing will ever be enough.
- You know the deteriorating climate is affecting your health or your child's but you do not know how you can stop it.
- To feel powerless against a supposedly impending doom shoots up stress levels and causes anxiety, say medicos.
- In 2017, the American Psychological Association referred to the condition as eco-anxiety.

## 2.4 Ice Free Arctic

### Why in News?

Arctic Ocean may be ice-free for part of year by 2044, finds study

### What are the important facts about Arctic?

- The Arctic is located at the northernmost part of our planet.
- Scientists usually define the Arctic as the area above the '**Arctic Circle**' — an imaginary line that circles around the top of the globe.
- The Arctic consists of the Arctic Ocean and parts of Canada, Russia, the USA, Greenland, Norway, Finland, Sweden and Iceland.
- Because of the Earth's tilt, for at least one day a year there's an entire day of darkness in this freezing region — and also a full day of sunshine.
- Temperatures as low as  $-70^{\circ}\text{C}$  have been recorded in northern Greenland.
- Indigenous people of the Arctic, called the '**Inuits**'.
- Enormous ice sheet rests on water and not land.
- Wildlife: polar bears, Arctic foxes, walruses, seals and whales.
- **Narwhal**, often referred to as the 'unicorn of the sea' is found in Arctic.
- The ice of the Arctic contains around ten percent of the world's fresh water.

## 2.5 Paris Pact

### Why in News?

Donald Trump slams India and China, says Paris pact is unfair to the U.S.

### What is Paris climate agreement?

- The Paris climate agreement also referred to as the Paris climate accord, Paris climate deal or Paris agreement.
- It is a pact sponsored by the United Nations to bring the world's countries together in the fight against climate change.

### What is the overall mission?

- Countries that sign on to be a part of the pact agreed to limit the century's global average temperature increase to no more than 2 degrees Celsius above the levels from the years 1850-1900 (the pre-industrial era).
- The agreement also states a more rigid goal of limiting temperature increases to only 1.5 degrees Celsius above pre-industrial era levels.

### What is each country responsible for?

- Participating nations made a historic pact on Dec. 12, 2015, in Paris, France, to adopt green energy sources, cut down on greenhouse gas emissions and limit the rise of global temperatures.
- Under the agreement, every country has an individual plan (or “Nationally Determined Contributions”) to tackle its greenhouse gas emissions.
- For example, under the Obama administration, the country vowed to cut its emissions by 26 to 28 percent below 2005 levels by the year 2025.
- The U.S. also pledged \$3 billion to the Green Climate Fund, which helps developing countries adapt and mitigate practices to fight climate change.
- The overall agreement asks developed countries to provide \$100 billion to the fund.

#### **Is it legally binding?**

- According to the U.N.’s website on climate change, the agreement has a “hybrid of legally binding and non-binding provisions.”
- But there’s no clear cut consequence or penalty for countries that fall short of their pledged goals.

#### **How does withdrawal from the agreement work?**

- Governments can either request a formal withdrawal, which takes four years, or they could withdraw from the United Nations Framework Convention on Climate Change altogether.
- Withdrawing from the underlying convention would signal a country’s departure from any United Nations-sponsored climate discussions.

## **2.6 Snow Leopard**

### **Why in News?**

Conservationist says protection of snow leopards involves various stakeholders

#### **What are the national parks where you can spot snow leopards in India?**

- Hemis National Park
- Dachigam National Park
- Great Himalayan National Park
- Pin Valley National Park
- Gangotri National Park
- Valley of Flower National Park
- Nanda Devi National Park
- Govind Pashu Vihar National Park
- Khangchendzonga National Park
- Namdapha National Park

## **2.7 Wasteland Conversion**

### **Why in News?**

Environmentalists says wasteland conversion threatens livelihoods, ecological balance

#### **What are wastelands?**

Wastelands include degraded forests, overgrazed pastures, drought-struck pastures, eroded valleys, hilly slopes, waterlogged marshy lands, barren land etc.

#### **What are the types of Wastelands?**

##### **(a) Culturable Wastelands:**

These are cultivable wastelands which are not being utilised to their full potential or are being mismanaged due to various reasons such as State or private occupation or having being declared as notified forest area.

##### **(b) Unculturable Wastelands:**

These are the wastelands which are not available for cultivation. These include barren rocky lands, steep sloping areas and areas covered by snow or glaciers.

### Why ecological imbalance?

- India converted more than 14,000 square km of ‘wasteland’ — mostly dense scrub, glacial areas, sands or marshland — into productive use between 2008-09 and 2015-16.
- The government’s target to restore 26 million hectares of wasteland and degraded land by 2030 risks affecting the livelihoods of pastoralists, fishermen and nomadic farmers who are often dependent on these traditional “commons” lands, caution environmental policy researchers and social activists.
- These also act as a buffer against floods, droughts and pollution for a wider population, they point out.

## 3. BIO-TECHNOLOGY

### 3.1 28 Million Obese by 2030

#### Why in News?

According to the World Obesity Federation, around 28 million children in India will be obese by the year 2030 and the country would rank second in the world in terms of the high number of obese people.

#### What is Malnutrition?

Malnutrition, in all its forms, includes:

- Under nutrition (wasting, stunting, underweight)
- Inadequate vitamins or minerals
- Overweight, obesity, and resulting diet-related noncommunicable diseases.

#### What is obesity and overweight?

- Overweight and obesity is when a person is too heavy for his or her height.
- Abnormal or excessive fat accumulation can impair health.
- Body mass index (BMI) is an index of weight-for-height commonly used to classify overweight and obesity.
- It is defined as a person’s weight in kilograms divided by the square of his/her height in meters ( $\text{kg}/\text{m}^2$ ).
- In adults, overweight is defined as a BMI of 25 or more, whereas obesity is a BMI of 30 or more.
- Overweight and obesity result from an imbalance between energy consumed (too much) and energy expended (too little).
- Globally, people are consuming foods and drinks that are more energy-dense (high in sugars and fats), and engaging in less physical activity.

### 3.2 A1 or a2?

#### Why in News?

The latest conundrum in the dairy world is the choice between A1 and A2 milk.

#### What do the terms mean?

- Casein is the largest group of proteins in milk, making up about 80% of total protein content.
- There are several types of casein in milk.
- Beta-casein is the second most prevalent and exists in at least 13 different forms.
- The two most common forms are:
  - A1 beta-casein.
  - A2 beta-casein.
- Originally, all cows would produce only A2 protein.
- Over the millennia however, a genetic mutation made many of them start producing both A1 and A2 proteins, with some producing A1 only.
- Some studies suggest that A1 beta-casein may be harmful and that A2 beta-casein is a safer choice.
- Thus, there is some public and scientific debate over these two types of milk.
- A2 milk is produced and marketed by the A2 Milk Company and contains no A1 beta-casein.

- It is said that India's *desi* cow breeds like Tharparkar, Gir, and Sahiwal have a genetic make-up that yields milk high in A2.
- All indigenous breeds, or *Bos indicus*, have a higher frequency of A2 protein.

### 3.3 Alzheimer's Drug

#### Why in News?

Oligomannate, which uses extract from marine brown algae as raw material, received a conditional green light to treat mild-to-moderate level Alzheimer Disease.

#### What is Alzheimer?

- Alzheimer's disease is a progressive disorder that causes brain cells to waste away (degenerate) and die.
- Alzheimer's disease is the most common cause of dementia — a continuous decline in thinking, behavioral and social skills that disrupts a person's ability to function independently.
- The early signs of the disease may be forgetting recent events or conversations.
- As the disease progresses, a person with Alzheimer's disease will develop severe memory impairment and lose the ability to carry out everyday tasks.

#### What is Brown algae?

- Brown algae, (class Phaeophyceae), class of about 1,500 species of algae in the division Chromophyta.
- It is common in cold waters along continental coasts.
- Species colour varies from dark brown to olive green, depending upon the proportion of brown pigment (fucoxanthin) to green pigment (chlorophyll).
- Brown algae vary in form and size from small filamentous epiphytes to complex giant kelps that range in size from 1 to more than 100 metres.
- Freshwater species are rare.
- Brown algae multiply by asexual and sexual reproduction; both the motile zoospores and gametes have two unequal flagella.
- Some seaweed species have gas-filled bladders (pneumatocysts), which keep photosynthetic parts of the algal thallus floating on or near the surface of the water.

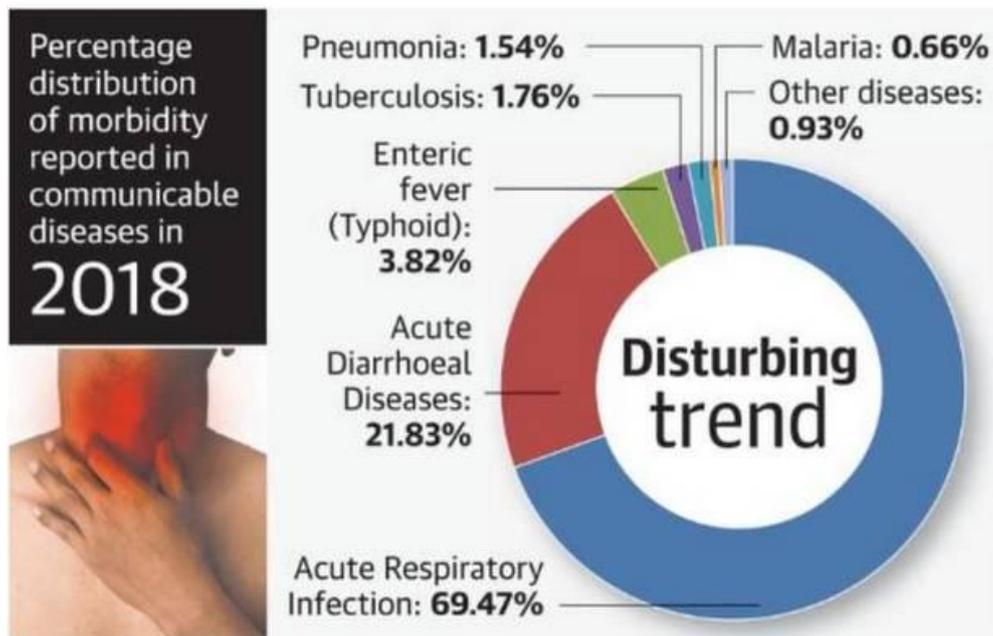
### 3.4 ARI - highly Mortal

#### Why in News?

Lung infections accounted for 69% morbidity in 2018 - National Health Profile report.

#### What are the other outcomes of the report?

- This report was recently released by the Union Health Ministry.
- Acute Respiratory Infections (ARI) accounted for 69.47% of morbidity last year.
- This was the highest in the communicable disease category leading to 27.21% mortality.
- Andhra Pradesh, Gujarat, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh and West Bengal reported a large number of patients and fatalities due to ARI.



### What is Acute Respiratory Infection?

- Acute respiratory infection is a serious infection that prevents normal breathing function.
- It usually begins as a viral infection in the nose, trachea (windpipe), or lungs.
- If the infection is not treated, it can spread to the entire respiratory system.
- It may lead to respiratory illness such as chronic bronchitis, emphysema, heart disease, asthma, wheezing, coughing and difficulty in breathing.
- Acute respiratory infection prevents the body from getting oxygen and can result in death.
- Person suffering from this condition needs medical assistance immediately.
- Also, acute respiratory infections are infectious, which means they can spread from one person to another.

### 3.5 Avian Botulism

#### Why in News?

Avian botulism killed 18,000 birds at Sambhar.

#### What is Avian botulism?

- Botulinum is a natural toxin produced by a bacteria known as Clostridium botulin.
- It produces the toxin when it starts reproducing.
- The bacteria is commonly found in the soil, river, and sea water.
- There are around eight types — A, B, C<sub>1</sub>, C<sub>2</sub>, D, E, F, and G — of botulinum toxin and they are distinguishable when diagnosed.
- But all types of toxins attack the neurons, which leads to muscle paralysis, states a study.
- Botulinum affects both humans and animals but the type of the toxin varies — botulinum C in birds and A, B and E in humans.

### 3.6 Cellphone Causes Insomnia

#### Why in News?

The results of a study states that excessive use of mobile phone during bed time adversely affects the quality of sleep.

#### What is Insomnia?

- Insomnia is a sleep disorder that is characterized by difficulty falling and/or staying asleep.

- People with insomnia have one or more of the following symptoms:
- Difficulty falling asleep
- Waking up often during the night and having trouble going back to sleep
- Waking up too early in the morning
- Feeling tired upon waking

**What are the types of insomnia?**

- There are two types of insomnia: primary insomnia and secondary insomnia.
- **Primary insomnia:** Primary insomnia means that a person is having sleep problems that are not directly associated with any other health condition or problem.
- **Secondary insomnia:** Secondary insomnia means that a person is having sleep problems because of something else, such as a health condition (like asthma, depression, arthritis, cancer, or heartburn); pain; medication they are taking; or a substance they are using (like alcohol).

**What are the classifications of organism based on their activity?**

- **Diurnal** by definition means of or during the day. Animals that are diurnal are active during the day.
- **Crepuscular** means of Twilight. Crepuscular animals are active during twilight.
- **Nocturnal** means done or active during the night. Nocturnal animals are usually more vulnerable to predation, so keeping active only during the night makes them somewhat "invisible"(mice).
- **Matutinal** means of or occurring in the morning. Matutinal organisms wake up before diurnal organisms.
- **Vespertine** means relating or occurring in the evening. Vespertine organisms are similar to Nocturnal organisms.

**3.7 Earliest evidence of Insect Pollination**

**Why in News?**

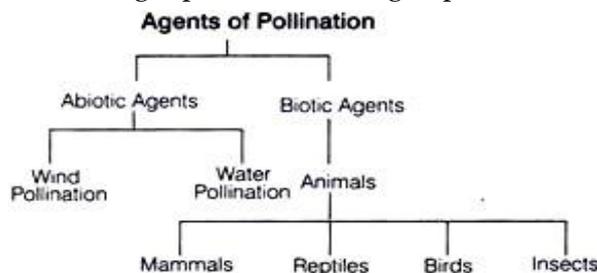
The first known instance of an insect pollinating a flower happened 99 million years ago, according to a study which pushes the earliest documented instance of the process back by at least 50 million years than previously thought.

**What are the types of pollination?**

- **Autogamy (Self-pollination)** - It is the kind of pollination in which the pollen from the anthers of a flower is transferred to the stigma of the same flower, e.g., wheat, rice, pea, etc.
- **Geitonogamy** - It is a kind of pollination where the pollen grains from the anther of the flower are transferred to the stigma of another flower borne on the same plant but at different branches. It usually occurs in plants, which show monoecious condition, e.g., Cucurbita.
- **Xeno-gamy (Cross-Pollination)** - It involves the transfer of pollen grains from the flower of one plant to the stigma of the flower of another plant. This is the only type of pollination which brings genetically different types of pollen grains to the stigma during pollination, e.g., papaya, maize, etc.

**What are the agents of pollination?**

The agents responsible for pollination in angiosperms have been grouped into two main categories.



### 3.8 E-cigarettes Ban

#### Why in News?

Health Minister Harsh Vardhan told the Lok Sabha that the Union government's move to ban the sale of electronic cigarettes was a "pre-emptive strike" before the new form of intoxication spreads as the companies making them were looking at India as an attractive market.

#### What are E-cigarettes?

- An electronic cigarette is a battery-operated device.
- It emits doses of vaporized nicotine, or non-nicotine solutions, for the user to inhale.
- It aims to provide a similar sensation to inhaling tobacco smoke, without the smoke.
- It is also known as e-cigarettes, e-cigs, electronic nicotine delivery systems, vaporizer cigarettes, and vape pens.
- They are marketed as a way to stop or cut down on smoking.

#### What are the harmful effects of e-cigarettes reported?

Use of e-cigarettes has documented adverse effects on humans which includes

- DNA damage
- Carcinogenesis
- Cellular
- Molecular and immunological toxicity
- Respiratory, cardiovascular and neurological disorders and
- Adverse impact on foetal development and pregnancy

### 3.9 IndiGen Project

#### Why in News?

CSIR recently announced the conclusion of conducting a "whole-genome sequence" of a 1,008 Indians.

#### What is IndiGen?

- The project of sequencing genome is part of a programme called "IndiGen".
- It is also seen as a precursor to a much larger exercise involving other government departments to map a larger swathe of the population in the country.
- Project proponents say this will widen public understanding in India about genomes and the information that genes hide about one's susceptibility to disease.

#### What is whole genome sequencing?

- A genome is the DNA, or sequence of genes, in a cell.
- Most of the DNA is in the nucleus and intricately coiled into a structure called the chromosome.
- The rest is in the mitochondria, the cell's powerhouse.
- Every human cell contains a pair of chromosomes, each of which has three billion base pairs or one of four molecules that pair in precise ways.
- The order of base pairs and varying lengths of these sequences constitute the "genes", which are responsible for making amino acids, proteins and, thereby, everything that is necessary for the body to function.
- It is when these genes are altered or mutated that proteins sometimes do not function as intended, leading to disease.
- Sequencing a genome means deciphering the exact order of base pairs in an individual.
- This "deciphering" or reading of the genome is what sequencing is all about.

### 3.10 Kerala on right Track tackling TB

#### Why in News?

World Health Organization on the Revised National Tuberculosis Control Programme (RNTCP) has lauded Kerala for being right on track to achieve TB elimination by 2025.

#### What is TB?

- Tuberculosis (TB) is caused by bacteria, *Mycobacterium tuberculosis*.
- It most often affects lungs.
- Tuberculosis is curable and preventable.
- TB is spread from person to person through the air.
- You get TB when you breathe in TB bacteria, released by someone in air through cough or sneeze.

#### What is National Strategic Plan (NSP) 2017 – 2025?

- The National Strategic Plan (NSP) 2017 - 2025 is the plan produced by the government of India (GoI) which sets out the government to eliminate TB in India.
- The NSP 2017 - 2025 describes the activities and interventions that the GoI will bring about significant change in the incidence, prevalence and mortality from TB.
- This is in addition to what is already going on in the country.
- The NSP sets out the recommendations of the GoI.

#### What is RNTCP?

- The National TB Control Programme was started in 1962 with the aim to detect cases earliest and treat them.
- In the district, the programme is implemented through the district Tuberculosis Centre (DTC) and the Primary Health Institutions.
- The District Tuberculosis Programme (DTP) is supported by the state level organization for the coordination and supervision of the programme.
- The Revised National Tuberculosis Control Programme (RNTCP), based on the Directly Observed Treatment, Short Course (DOTS) strategy, began as a pilot project in 1993.
- It was launched as a national programme in 1997 but rapid RNTCP expansion began in late 1998. The nation-wide coverage was achieved in 2006.
- The Revised National Tuberculosis Control Programme has initiated early and firm steps to its declared objective of Universal access to early quality diagnosis and quality TB care for all TB patients'.

### 3.11 Measles

#### Why in News?

Study says infants become susceptible to measles infection earlier than thought

#### 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

### 3.12 Pesticides affect DNA

#### Why in News?

Study says Pesticide exposure among tea estate workers could affect their DNA.

#### What are the types of pesticides?

- **Algaecides** are used for killing and/or slowing the growth of algae.
- **Antimicrobials** control germs and microbes such as bacteria and viruses.
- **Biopesticides** are made of living things, come from living things, or they are found in nature.
- **Desiccants** are used to dry up living plant tissues.
- **Defoliants** cause plants to drop their leaves.
- **Disinfectants** control germs and microbes such as bacteria and viruses.
- **Foggers** (total release foggers) are used to kill insects that are in the open and touch the pesticides.
- **Fungicides** are used to control fungal problems like molds, mildew, and rust.
- **Herbicides** kill or inhibit the growth of unwanted plants, aka weeds.
- **Illegal and Counterfeit Pesticides** are imported or sold illegally.
- **Insecticides** are used to control insects.
- **Insect Growth Regulators** disrupt the growth and reproduction of insects.
- **Minimum Risk Pesticides** are exempt from EPA registration, but many states require them to be registered.
- **Miticides** control mites that feed on plants and animals. Mites are not insects, exactly.
- **Molluscicides** are designed to control slugs, snails and other molluscs.
- **Mothballs** are insecticides used to kill fabric pests by fumigation in sealed containers.
- **Natural and Biological Pesticides** control pests using things found in nature, or man-made versions of things found in nature.
- **Ovicides** are used to control eggs of insects and mites.
- **Pheromones** are biologically active chemicals used to attract insects or disrupt their mating behavior. The ratio of chemicals in the mixture is often species-specific.
- **Plant Growth Regulators** are used to alter the growth of plants. For example, they may induce or delay flowering.
- **Repellents** are designed to repel unwanted pests, often by taste or smell.
- **Rodenticides** are used to kill rodents like mice, rats, and gophers.
- **Synergists** make certain pesticides more effective, but they are not effective when used alone.
- **Wood Preservatives** are used to make wood resistant to insects, fungus and other pests.

### 3.13 Plague

#### Why in News?

China says plague outbreak risk minimal after 2 new cases in Beijing.

#### What is plague?

- Plague is a serious and potentially fatal **bacterial** infection caused by the bacteria *Yersinia pestis*.
- Humans can contract the disease from the bite of an infected flea.
- Rodents, including rats, often carry both the plague and the fleas that spread it.
- While cases of people becoming infected through the handling of carrier animals have occurred, such instances are rare.
- The most common type of plague seen throughout history is the bubonic plague, which is an infection of the lymph nodes.
- Other common types include pneumonic plague, an infection of the lungs, and septicemic, which affects the blood.
- Time between infection and the first appearance of symptoms is typically 2 to 8 days.
- However, pneumonic plague symptoms can appear as soon as 1 day following infection.

### 3.14 Promising Immunotherapy

#### Why in News?

Tata Memorial Hospital says immunotherapy is the most promising area in oncology at present.

#### What is cancer?

- Each of the cells of the body have a tightly regulated system that controls their growth, maturity, reproduction and eventual death.
- Cancer begins when cells in a part of the body start to grow out of control.
- There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

#### What are carcinogens?

- A carcinogen is defined as any substance or radiation that promotes cancer formation or carcinogenesis.
- Chemical carcinogens may be natural or synthetic, toxic or non-toxic.
- Many carcinogens are organic in nature, such as benzo[a]pyrene and viruses.
- An example of carcinogenic radiation is ultraviolet light.

#### What are the types of cancer treatment?

- **Surgery.** The goal of surgery is to remove the cancer or as much of the cancer as possible.
- **Chemotherapy.** Chemotherapy uses drugs to kill cancer cells.
- **Radiation therapy.** Radiation therapy uses high-powered energy beams, such as X-rays or protons, to kill cancer cells.
- **Bone marrow transplant.** Your bone marrow is the material inside your bones that makes blood cells from blood stem cells. A bone marrow transplant, also known as a stem cell transplant, can use your own bone marrow stem cells or those from a donor.
- **Immunotherapy.** Immunotherapy, also known as biological therapy, uses your body's immune system to fight cancer.
- **Hormone therapy.** Some types of cancer are fueled by your body's hormones. Examples include breast cancer and prostate cancer. Removing those hormones from the body or blocking their effects may cause the cancer cells to stop growing.
- **Targeted drug therapy.** Targeted drug treatment focuses on specific abnormalities within cancer cells that allow them to survive.
- **Cryoablation.** This treatment kills cancer cells with cold. During cryoablation, a thin, wandlike needle (cryoprobe) is inserted through your skin and directly into the cancerous tumor. A gas is pumped into the cryoprobe in order to freeze the tissue. Then the tissue is allowed to thaw. The freezing and thawing process is repeated several times during the same treatment session in order to kill the cancer cells.

- **Radiofrequency ablation.** This treatment uses electrical energy to heat cancer cells, causing them to die.
- **Clinical trials.** Clinical trials are studies to investigate new ways of treating cancer. Thousands of cancer clinical trials are underway.

### 3.15 Protein to Manage Diabetes

#### Why in News?

Scientists have discovered a protein that helps manage insulin levels thereby showing the potential to tackle diabetes and neuro-degenerative disorders like dementia and Alzheimers.

#### What is Diabetes?

- Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high.
- Blood glucose is your main source of energy and comes from the food you eat.
- Insulin, a hormone made by the pancreas, helps glucose from food get into your cells to be used for energy.
- Sometimes your body doesn't make enough—or any—insulin or doesn't use insulin well.
- Glucose then stays in your blood and doesn't reach your cells.
- Over time, having too much glucose in your blood can cause health problems.
- Although diabetes has no cure, you can take steps to manage your diabetes and stay healthy.

#### What are the different types of diabetes?

The most common types of diabetes are type 1, type 2, and gestational diabetes.

#### Type 1 diabetes

- Your body does not make insulin.
- Your immune system attacks and destroys the cells in your pancreas that make insulin.
- Type 1 diabetes is usually diagnosed in children and young adults, although it can appear at any age.
- People with type 1 diabetes need to take insulin every day to stay alive.

#### Type 2 diabetes

- Your body does not make or use insulin well.
- You can develop type 2 diabetes at any age, even during childhood.
- However, this type of diabetes occurs most often in middle-aged and older people.
- Type 2 is the most common type of diabetes.

#### Gestational diabetes

- Gestational diabetes develops in some women when they are pregnant.
- Most of the time, this type of diabetes goes away after the baby is born.
- However, if you've had gestational diabetes, you have a greater chance of developing type 2 diabetes later in life.
- Sometimes diabetes diagnosed during pregnancy is actually type 2 diabetes.

#### Other types of diabetes

Less common types include monogenic diabetes, which is an inherited form of diabetes, and cystic fibrosis-related diabetes.

### 3.16 Stimulating White Blood Cells helps clear TB bacteria

#### Why in News?

Instead of using drugs to directly kill TB bacteria, researchers have directly stimulated the immune system to kill the bacteria.

#### What are White Blood Cells?

- White blood cells account for only about 1% of your blood, but their impact is big.
- White blood cells are also called leukocytes.

- They protect you against illness and disease.
- White blood cells are made in the bone marrow.
- They are stored in your blood and lymph tissues.
- Because some white blood cells have a short life of 1 to 3 days, your bone marrow is always making them.

#### What are the types of WBC?

- Monocytes. They have a longer lifespan than many white blood cells and help to break down bacteria.
- Lymphocytes. They create antibodies to fight against bacteria, viruses, and other potentially harmful invaders.
- Neutrophils. They kill and digest bacteria and fungi. They are the most numerous type of white blood cell and your first line of defense when infection strikes.
- Basophils. These small cells seem to sound an alarm when infectious agents invade your blood. They secrete chemicals such as histamine, a marker of allergic disease, that help control the body's immune response.
- Eosinophils. They attack and kill parasites and cancer cells, and help with allergic responses.

### 3.17 World's First Typhoid Vaccine

#### Why in News?

Pakistan became the first country in the world to introduce a new typhoid vaccine in an effort to combat a drug-resistant strain of the potentially fatal disease in the Sindh province, officials said.

#### What is Typhoid?

- Typhoid is an infection caused by the bacterium *Salmonella typhimurium* (S. typhi).
- The bacterium lives in the intestines and bloodstream of humans.
- It spreads between individuals by direct contact with the feces of an infected person.
- No animals carry this disease, so transmission is always human to human.
- If untreated, around 1 in 5 cases of typhoid can be fatal. With treatment, fewer than 4 in 100 cases are fatal.
- S. typhi enters through the mouth and spends 1 to 3 weeks in the intestine. After this, it makes its way through the intestinal wall and into the bloodstream.
- From the bloodstream, it spreads into other tissues and organs.
- The immune system of the host can do little to fight back because S. typhi can live within the host's cells, safe from the immune system.
- Typhoid is diagnosed by detecting the presence of S. typhi via blood, stool, urine, or bone marrow sample.

## 4. INNOVATION

### 4.1 China Rolls Out 5G Services

#### Why in News?

China's three major state telecom operators rolled out 5G wireless technology, as the country races to narrow its technology gap with the US amid a bruising trade war.

#### What are the different generations of mobile network?

Parameters	1G	2G	3G	4G
Name	1st Generation Mobile Network	2nd Generation Mobile Network	3rd Generation Mobile Network	4th Generation Mobile Network
Introduced in year	1980s	1993	2001	2009



<b>Location of first commercialization</b>	USA	Finland	Japan	South Korea
<b>Technology</b>	AMPS (Advanced Mobile System), TACS (Advanced Phone NMT,	IS-95, GSM	IMT2000, WCDMA	LTE, WiMAX
<b>Multiple Address/Access system</b>	FDMA	TDMA, CDMA	CDMA	CDMA
<b>Switching type</b>	Circuit switching	Circuit switching for Voice and Packet switching for Data	Packet switching except for Air Interface	Packet switching
<b>Speed (data rates)</b>	2.4 Kbps to 14.4 kbps	14.4 Kbps	3.1 Mbps	100 Mbps
<b>Special Characteristic</b>	First wireless communication	Digital version of 1G technology	Digital broadband, speed increments	Very high speeds, All IP
<b>Features</b>	Voice only	Multiple users on single channel	Multimedia features, Video Call	High Speed, real time streaming
<b>Supports</b>	Voice only	Voice and Data	Voice and Data	Voice and Data
<b>Internet service</b>	No Internet	Narrowband	Broadband	Ultra Broadband
<b>Bandwidth</b>	Analog	25 MHz	25 MHz	100 MHz
<b>Operating frequencies</b>	800 MHz	GSM: 900MHz, 1800MHz CDMA: 800MHz	2100 MHz	850 MHz, 1800 MHz
<b>Band (Frequency) type</b>	Narrow band	Narrow band	Wide band	Ultra Wide Band
<b>Carrier frequency</b>	30 KHZ	200 KHZ	5 MHz	15 MHz
<b>Advantage</b>	Simpler (less complex) network	Multimedia features (SMS,	High security, international	Speed, High speed handoffs,

	elements	MMS), Internet access and SIM introduced	roaming	MIMO technology, Global mobility
<b>Disadvantages</b>	Limited capacity, not secure, poor battery life, large phone size, background interference	Low network range, slow data rates	High power consumption, Low network coverage, High cost of spectrum licence	Hard to implement, complicated hardware required
<b>Applications</b>	Voice Calls	Voice calls, Short messages, browsing (partial)	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, Wearable devices

### What is a 5G?

- 5G simply stands for fifth generation and refers to the next and newest mobile wireless standard based on the IEEE 802.11ac standard of broadband technology.
- Formal standard for 5G is yet to be set.
- According to the Next Generation Mobile Network's 5G white paper, 5G connections must be based on 'user experience, system performance, enhanced services, business models and management & operations'.
- And according to the Groupe Speciale Mobile Association (GSMA) to qualify for a 5G a connection should meet most of these eight criteria:
  1. One to 10Gbps connections to end points in the field
  2. One millisecond end-to-end round trip delay
  3. 1000x bandwidth per unit area
  4. 10 to 100x number of connected devices
  5. (Perception of) 99.999 percent availability
  6. (Perception of) 100 percent coverage
  7. 90 percent reduction in network energy usage
  8. Up to ten-year battery life for low power, machine-type devices

## 4.2 Warning - Phishing

### Why in News?

Google says it warned 500 users in India of government-backed phishing attacks

### What is Phishing?

- Phishing is the fraudulent use of electronic communications to deceive and take advantage of users.
- Phishing attacks attempt to gain sensitive, confidential information such as usernames, passwords, credit card information, network credentials, and more.
- By posing as a legitimate individual or institution via phone or email, cyber attackers use social engineering to manipulate victims into performing specific actions—like clicking on a malicious link or attachment—or willfully divulging confidential information.
- Both individuals and organizations are at risk;
- Almost any kind of personal or organizational data can be valuable, whether it be to commit fraud or access an organization's network.

- In addition, some phishing scams can target organizational data in order to support espionage efforts or state-backed spying on opposition groups.

#### **What is Pegasus?**

- Pegasus is meant to infiltrate smartphones silently and work on three things -- collect historic data on device, continuously monitor activity and transmit this data to a third party.
- Other than Android and iOS systems, Pegasus can also penetrate Symbian and BlackBerry-based devices.
- The malware can infect devices via phishing text messages that trick users into clicking a particular link, using the over-the-air update system and more.
- In WhatsApp's case, it used a vulnerability in the app that allowed infection through missed video calls.
- In all forms of installations, the spyware completes the process in the background, completely out of the user's notice.
- This, combined with the fact that Pegasus doesn't require the user's attention is one of the reasons why the spyware is so dangerous and popular amongst security contractors.