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Shankar IAS Academy™

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SCIENCE & TECHNOLOGY

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SCIENCE & TECHNOLOGY

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1. SPACE

1.1 Last Solar Eclipse

Why in News?

Last solar eclipse of the decade was seen by people across West and South Asia on December 26, 2019.

How solar eclipses happen?

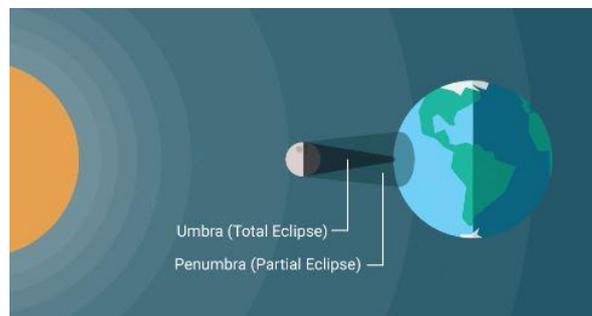
Solar Eclipses happen during a new moon, when the moon moves between the earth and the sun and the three celestial bodies form a straight line or almost a straight line: Earth – Moon – Sun.

What are the types of Solar Eclipses?



There are 3 kinds of Solar Eclipses. There is also a rare hybrid that is a combination of two eclipses.

Total Solar Eclipse



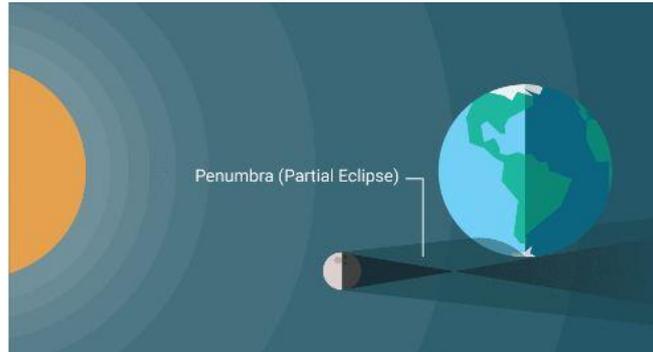
Total Solar Eclipses occur when the moon comes between the sun and the earth and casts the darkest part of its shadow (the Umbra) on Earth. The darkest point of the eclipse is almost as dark as night.

Annual Solar Eclipse



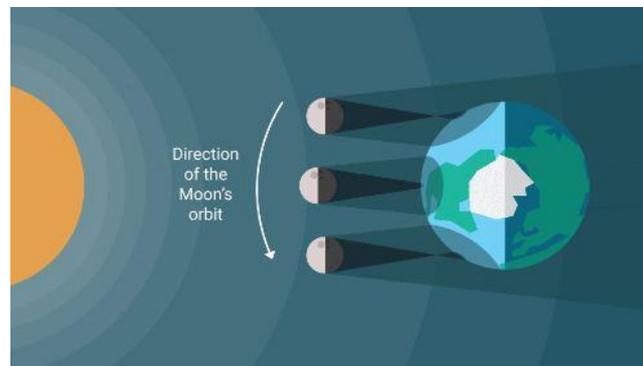
An Annual Solar eclipse happens when the moon covers the Sun's center, leaving the Sun's visible outer edges to form a "ring of fire" or annulus around the Moon.

Partial Solar Eclipse



Partial Solar Eclipses happen when the moon comes between the sun and the earth, but they don't align in a perfectly straight line. Because of this, the moon only partially covers the sun's disc.

Hybrid Solar Eclipse



A Hybrid Solar Eclipse is a rare form of Solar Eclipse, which changes from an Annular to a Total Solar Eclipse along its path.

1.2 PSLV Golden Jubilee

Why in News?

India's Polar Satellite Launch Vehicle (PSLV) marked its 'Golden Jubilee' launch by injecting India's advanced radar imaging satellite RISAT-2BR1.

What is RISAT-2BR1?

- RISAT-2BR1 is a radar imaging earth observation satellite.
- The satellite will provide services in the field of Agriculture, Forestry and Disaster Management.

Launch Vehicle : PSLV-C48/RISAT-2BR1

Type of Satellite : Earth Observation

Application : Disaster Management System, Earth Observation

Orbit Type : LEO

What is PSLV?

- PSLV (Polar Satellite Launch Vehicle) is an indigenously-developed expendable launch system of the ISRO (Indian Space Research Organization).
- It comes in the category of medium-lift launchers with a reach up to various orbits, including the Geo Synchronous Transfer Orbit, Lower Earth Orbit, and Polar Sun Synchronous Orbit.
- All the operations of PSLV are controlled from the Satish Dhawan Space Center, Sriharikota, east coast, India.

PSLV has a four-stage system comprising a combination of solid and liquid-fuelled rocket stages.

- The first stage at the very bottom is solid fuelled having six strap-on solid rocket boosters wrapped around it.

- Second stage is liquid fuelled whereas the third stage has a solid fuelled rocket motor.
- At the fourth stage, the launcher uses a liquid propellant to boost in the outer space.

1.3 Shape of Sun's Corona Accurately Predicted

Why in News?

Solar physicists from CESSI, IISER Kolkata, have succeeded in predicting the shape of Sun's corona at the time of the annular eclipse on December 25.

What are the different layers of sun?

Photosphere –

- The photosphere is the deepest layer of the Sun that we can observe directly.
- It reaches from the surface visible at the center of the solar disk to about 250 miles (400 km) above that.
- The temperature in the photosphere varies between about 6500 K at the bottom and 4000 K.
- Most of the photosphere is covered by granulation.

Chromosphere

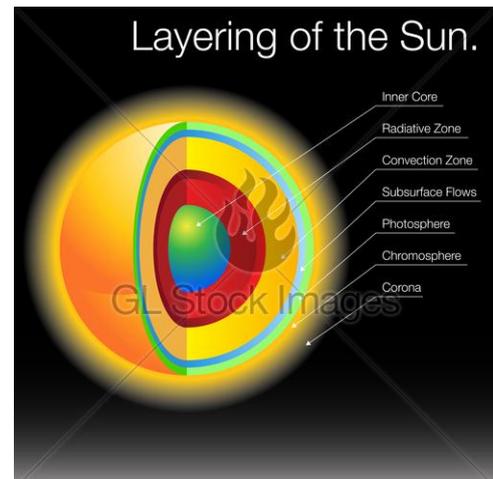
- The chromosphere is a layer in the Sun between about 250 miles (400 km) and 1300 miles (2100 km) above the solar surface (the photosphere).
- The temperature in the chromosphere varies between about 4000 K and 8000 K at the top.
- So in this layer (and higher layers) it actually gets hotter if you go further away from the Sun, unlike in the lower layers, where it gets hotter if you go closer to the center of the Sun.

Transition Region

- The transition region is a very narrow layer between the chromosphere and the corona.
- Here the temperature rises abruptly from about 8000 to about 500,000 K.

Corona

- The corona is the outermost layer of the Sun, starting at about 1300 miles (2100 km) above the solar surface (the photosphere).
- The temperature in the corona is 500,000 K or more, up to a few million K.
- The corona cannot be seen with the naked eye except during a total solar eclipse, or with the use of a coronagraph.
- The corona does not have an upper limit.



2. ENVIRONMENT

2.1 Carbon dots help detect herbicide pollution

Why in News?

Researchers from Assam have used the water hyacinth to produce carbon nanoparticles which can be used for detecting a commonly used herbicide — pretilachlor.

What are Carbon dots?

- C'dots are small carbon nanoparticle (less than 10 nm in size).
- C'dots are Biocompatible, have small size with relatively large surface area, photostable and photoluminescence properties.
- Fluorescent carbon dots are currently emerging as a class of promising fluorescent probe on account of their low photobleaching, versatile surfaces and excellent biocompatibility.

- Fluorescent carbon dots have attracted increasing attention due to their potential application in sensing, catalysis and biomedicine.

What are the properties of carbon Dots?

- Excellent water solubility
- Biocompatibility
- Good conductivity
- Photochemical stability
- Low toxicity
- Environmental Friendliness

What are the applications of C'dots?

- Bio sensing
- Optronics
- Catalysis
- Drug delivery
- Bio imaging

2.2 First Nesting

Why in News?

Odisha's Rushikulya sees first olive ridley nesting.

What are the important facts about Olive ridley?

- The Olive ridley turtles are the smallest and most abundant of all sea turtles found in the world.
- It inhabits warm waters of the Pacific, Atlantic and Indian oceans.
- These turtles, along with their cousin the Kemps ridley turtle, are best known for their unique mass nesting called Arribada, where thousands of females come together on the same beach to lay eggs.
- Though found in abundance, their numbers have been declining over the past few years, and the species is recognized as Vulnerable by the IUCN Red list.
- Males and females grow to the same size; however, females have a slightly more rounded carapace as compared to the male.
- They are carnivores, and feed mainly on jellyfish, shrimp, snails, crabs, molluscs and a variety of fish and their eggs.
- These turtles spend their entire lives in the ocean, and migrate thousands of kilometers between feeding and mating grounds in the course of a year.
- Gahirmatha marine sanctuary and Rushikulya rookery coast in Ganjam district, Odisha are main Olive Ridley Nesting sites.
- Gahirmatha marine sanctuary is the largest rookery (mass nesting site) of Olive Ridley turtles.
- Odisha is home to 50% of the total world's population of Olive Ridleys and about 90% of Indian population of sea turtles.
- Odisha forest department added another olive ridley mass nesting site **Bahuda Rookery** at beach on Bahuda river mouth in Ganjam district.

2.3 Heavy metals contaminating India's Rivers

Why in News?

Samples taken from two-thirds of the water quality stations spanning India's major rivers showed contamination by one or more heavy metals, exceeding safe limits set by the Bureau of Indian Standards.

What are heavy metals?

- The term heavy metal refers to any metallic chemical element that has a relatively high density and is toxic or poisonous at low concentrations.

- Examples of heavy metals include mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb).
- Heavy metals are natural components of the Earth's crust.
- They cannot be degraded or destroyed.
- To a small extent they enter our bodies via food, drinking water and air.

How heavy metals affect body mechanism?

- As trace elements, some heavy metals (e.g. copper, selenium, zinc) are essential to maintain the metabolism of the human body.
- At higher concentrations they can lead to poisoning.
- Heavy metal poisoning could result, for instance, from drinking-water contamination (e.g. lead pipes), high ambient air concentrations near emission sources, or intake via the food chain.
- Heavy metals are dangerous because they tend to bioaccumulate.

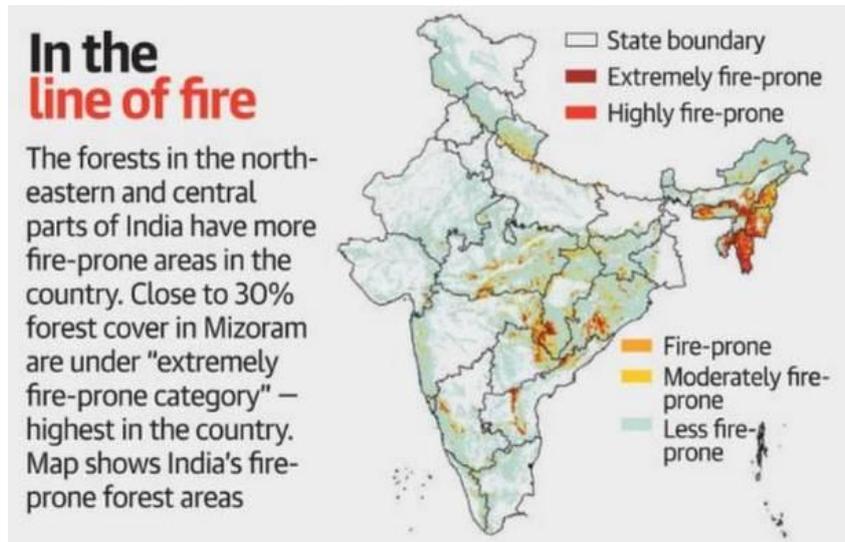
2.4 Imminent danger of Forest Fire

Why in News?

One-fifth of country's forests prone to fires: study.

What are the findings of the study?

- About 21.40% of forest cover in India is prone to fires, with forests in the north-eastern region and central India being the most vulnerable, the 2019 report by the Forest Survey of India (FSI) has said.
- The forest fire points (FFP) were analysed using a moderate resolution imaging spectroradiometer (MODIS) by overlaying the points coverage over the grid coverage of 5 km x 5 km.



- North-eastern and central India are the most vulnerable regions.
- The overall green cover has increased in the country.
- But, the forest cover in the north-east – particularly in Mizoram, Arunachal Pradesh and Nagaland – has decreased.

What are the positive effects of forest fire?

- Cleaning up forests of dead and decaying matter (natural fuel during drought periods)
- Maintaining ecosystem balance by removing diseased plants and harmful insects
- Regenerating seeds through increased sunlight

What are the negative effects of forest fire?

- Damage the habitat of the environment—which depends on the soil type and the fire's intensity
- Affect the species population and distribution after an incident

- Destroy homes and buildings
- Incur costly evacuations and destruction
- Create heavy smog that is harmful to living things
- Take animal and human lives

2.5 Plummeting Oxygen Levels

Why in News?

The loss of oxygen from the ocean due to climate change risks “dire effects” on sea life, fisheries and coastal communities.

What are the outcomes of the study?

- The International Union for the Conservation of Nature (IUCN) said that around 700 sites had been identified globally with low oxygen levels — up from only 45 in the 1960s.
- In the same period, the group warned, the volume of anoxic waters — areas totally devoid of oxygen — have quadrupled.
- The ocean absorbs around a quarter of all fossil fuel emissions, but as global energy demand continues to grow, there are fears that the world’s seas will eventually reach saturation point.
- Oceans are expected, on current trends, to lose 3-4% of their oxygen globally by 2100.
- Most of that loss is predicted to be in the upper 1,000 metres, which is the richest part of the ocean for biodiversity.

What is Dissolved oxygen?

- Dissolved Oxygen is the amount of gaseous oxygen (O₂) dissolved in the water.
- Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis.
- Water temperature and the volume of moving water can affect dissolved oxygen levels.
- Oxygen dissolves easier in cooler water than warmer water.
- Adequate dissolved oxygen is important for good water quality and necessary to all forms of life.
- Dissolved oxygen levels that drop below 5.0 mg/L cause stress to aquatic life.
- Lower concentrations cause greater stress.
- Oxygen levels that go below 1-2 mg/L for a few hours may result in large fish kills

2.6 Monsoon History

Why in News?

Monsoon decided history of Indian subcontinent: study.

What are the findings of the study?

- Several dynasties, such as the Sena in Bengal, Solanki in Gujarat in the mid-13th century and Paramara and Yadav in the early to mid-14th century – all of which flourished during abundant rainfall — declined during the dry phases of Indian summer monsoon (ISM), suggesting role of the climate in the socio-political crisis, the study revealed.
- Deficient rainfall led to the collapse of the Mansabdari system, started by Mughal emperor Akbar, in the late 17th century.
- Similarly, drought interspersed with violent monsoon rains sounded the death knell for the Khmer empire of south-east Asia in the 15th century.
- A recent study by researchers has revealed that abrupt changes in the Indian monsoon in the last 900 years decided the course of human history in the subcontinent.

What causes a monsoon?

- A monsoon arises due to a difference in temperatures between a land mass and the adjacent ocean.
- The sun warms the land and ocean differently, according to Southwest Climate Change.

- This differential heating causes the winds to eventually switch directions bringing the cooler, moister air from over the ocean.
- The winds reverse again at the end of the monsoon season

2.7 Natural gas drives record CO₂ emissions in 2019

Why in News?

Global carbon emissions boosted by soaring natural gas use are set to hit record levels in 2019 despite a decline in coal consumption and a string of countries declaring a climate emergency.

What is natural gas?

- Natural gas is a fossil energy source that formed deep beneath the earth's surface.
- Natural gas contains many different compounds.
- The largest component of natural gas is methane.
- Natural gas also contains smaller amounts of natural gas liquids (NGL, which are also hydrocarbon gas liquids), and nonhydrocarbon gases, such as carbon dioxide and water vapor.
- We use natural gas as a fuel and to make materials and chemicals.
- Natural gas is mainly used as fuel for generating electricity and heat.
- Natural gas in compressed form is used as fuel for vehicles which is known as CNG.
- It is used as fuel for boilers and air conditioners worldwide.
- This is used for making fertilizers also, mainly ammonia.

How did natural gas form?

Millions to hundreds of millions of years ago and over long periods of time, the remains of plants and animals (such as diatoms) built up in thick layers on the earth's surface and ocean floors, sometimes mixed with sand, silt, and calcium carbonate. Over time, these layers were buried under sand, silt, and rock. Pressure and heat changed some of this carbon and hydrogen-rich material into coal, some into oil (petroleum), and some into natural gas.

What are petroleum products?

Fuels

- butane
- diesel fuel
- fuel oil
- gasoline
- kerosene
- liquefied natural gas
- liquefied petroleum gas
- propane

Other products

- microcrystalline wax
- napalm
- naphtha
- naphthalene
- paraffin wax
- petroleum jelly
- petroleum wax
- refined asphalt
- refined bitumen

2.8 Oldest Fossil Forest Found

Why in News?

Scientists have discovered remnants of the world's oldest fossil forest — an extensive network of trees around 386 million years old — in a sandstone quarry in the U.S.

What is the principal behind radiocarbon dating?

- Radiocarbon (carbon 14) is an isotope of the element carbon that is unstable and weakly radioactive.
- The stable isotopes are carbon 12 and carbon 13.
- Carbon 14 is continually being formed in the upper atmosphere by the effect of cosmic ray neutrons on nitrogen 14 atoms.
- It is rapidly oxidized in air to form carbon dioxide and enters the global carbon cycle.
- Plants and animals assimilate **carbon 14** from carbon dioxide throughout their lifetimes.
- When they die, they stop exchanging carbon with the biosphere and their carbon 14 content then starts to decrease at a rate determined by the law of radioactive decay.
- Radiocarbon dating is essentially a method designed to measure residual radioactivity.
- C-14 dating is only applicable to organic and some inorganic materials (not applicable to metals).
- Gas proportional counting, liquid scintillation counting and accelerator mass spectrometry are the three principal radiocarbon dating methods.

2.9 Supreme Court against Transfer of Community Resources

Why in News?

The Government has no right to transfer “invaluable” community resources like village water ponds to a few powerful people and industrialists for commercialisation of the property, when many areas of the country perennially face water crisis and access to drinking water is woefully inadequate, the Supreme Court has held.

What is Community resource?

- A community resource is anything that has the potential to improve the quality of life in a community.
- It includes public services, such as libraries and post offices; gathering places, such as community centers and churches; and businesses that serve the community by providing jobs and easy access to necessary products.
- Individuals who work to improve community life by helping others, cleaning up the community or organizing informal community activities are also community resources.

2.10 Swachh Survekshan 2019

Why in News?

Indore and Jamshedpur have topped the cleanliness charts for two consecutive quarters among cities with over 10 lakh population and with 1 lakh to 10 lakh population respectively.

What is Swachh Survekshan?

- Swachh Survekshan is a ranking exercise taken up by the Government of India to assess rural and urban areas for their levels of cleanliness and active implementation of Swachhata mission initiatives in a timely and innovative manner.
- The objective of the survey is to encourage large scale citizen participation and create awareness amongst all sections of society.
- To make towns and cities a better place to live in.
- Additionally, the survey also intends to foster a spirit of healthy competition among towns and cities to improve their service delivery to citizens, towards creating cleaner cities and towns.
- The Ministry of Urban Development, Government of India takes up the Swachh Survekshan in urban areas and the Ministry of Drinking Water and Sanitation in rural areas.
- The Quality Council of India (QCI) has been commissioned the responsibility of carrying out the assessment.

2.11 Cheetah Extinction in India

Why in News?

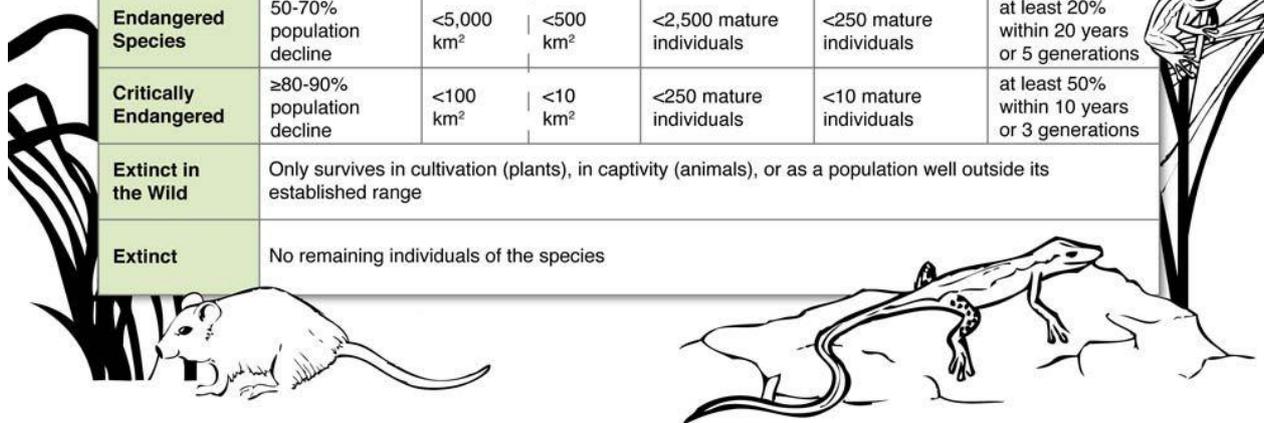
Research suggests cheetahs were hunted and captured indiscriminately in the 1700s and 1800s which led to their extinction in India.

What really caused the extinction?

- We know is this: two idiosyncratic traits of the animal undeniably led to its end.
- One, the cat was very easy to tame: it was often trained to race down and hunt animals, almost like a hound – a ‘sport’ called coursing – and so was caught in large numbers for use in such hunts.
- Second, cheetahs were nearly impossible to breed in captivity.

Endangered Species: Categories and Criteria

	Population Reduction Rate	Geographic Range		Population Size	Population Restrictions	Extinction Probability (in the wild)
		Extent of Occurrence	Area of Occupancy			
Least Concern	A species that has a widespread and abundant population					
Near Threatened	A species that is likely to qualify for a threatened category in the near future					
Vulnerable Species	30-50% population decline	<20,000 km ²	<2,000 km ²	<10,000 mature individuals	<1,000 mature individuals or an area of occupancy of <20 km ²	at least 10% within 100 years
Endangered Species	50-70% population decline	<5,000 km ²	<500 km ²	<2,500 mature individuals	<250 mature individuals	at least 20% within 20 years or 5 generations
Critically Endangered	≥80-90% population decline	<100 km ²	<10 km ²	<250 mature individuals	<10 mature individuals	at least 50% within 10 years or 3 generations
Extinct in the Wild	Only survives in cultivation (plants), in captivity (animals), or as a population well outside its established range					
Extinct	No remaining individuals of the species					



3. BIO-TECHNOLOGY

3.1 AASHA Scheme

Why in News?

Less than 3% of this season’s sanctioned amount of pulses and oilseeds have actually been procured so far under the once-hyped PM-AASHA scheme, Agriculture Ministry data show.

What is AASHA scheme?

- Scheme Pradhan Mantri Annadata Aay SanraksHan Abhiyan (PM-AASHA), that is aimed towards ensuring remunerative prices to farmers for their produce.
- The recent scheme is expected to complement the increase in MSP which will be translated to farmer's income by way of robust procurement mechanism in coordination with the states.

What are the components of PM-AASHA?

It is aimed towards enhancing agricultural productivity, reducing cost of cultivation which will enable boosting and securing farmer's income in the long run.

The three components outlined under the scheme.

- Price Support Scheme (PSS)
- Price Deficiency Payment Scheme (PDPS)
- Pilot of Private Procurement & Stockist Scheme (PPPS)

3.2 Antibiotic Prescription Rate

Why in News?

The study is the first ever estimate of outpatient antibiotic prescription rates and patterns in the private sector and has been published.

What is an Antibiotic?

- Antibiotics are medicines that help stop infections caused by bacteria.
- They do this by killing the bacteria or by keeping them from copying themselves or reproducing.
- Any drug that kills germs in your body is technically an antibiotic.
- But most people use the term when they're talking about medicine that is meant to kill bacteria.

What Antibiotics Can and Can't Do?

- Only bacterial infections can be killed with antibiotics.
- The common cold, flu, most coughs, some bronchitis infections, most sore throats, and the stomach flu are all caused by viruses.
- The types of infections that can be treated with antibiotics are:
 - Some ear and sinus infections
 - Dental infections
 - Skin infections
 - Meningitis (swelling of the brain and spinal cord)
 - Strep throat
 - Bladder and kidney infections
 - Bacterial pneumonias
 - Whooping cough

3.3 Biomarkers for Glioblastoma found

Why in News?

Researchers have found potential gene biomarkers that can be used for prognosis and early diagnosis of the most aggressive form of primary brain tumour called glioblastoma.

What is the difference between a tumor and cancer?

- Cancer is a disease in which cells, almost anywhere in the body, begin to divide uncontrollably.
- A tumor is when this uncontrolled growth occurs in solid tissue such as an organ, muscle, or bone.
- Tumors may spread to surrounding tissues through the blood and lymph systems.
- Cancer treatment aims to eradicate these abnormal cells, or to slow or stop them from spreading.
- Tumors are sometimes cancerous but this does not mean that tumors and cancers are synonyms (as most people think).
- Not all lumps are not cancerous(just a few of them).
- So a proper examination of lumps is very important.

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.

3.4 Drug Resistant TB

Why in News?

Researchers from Bengaluru have made an important discovery of the mechanism used by TB bacteria to tolerate TB drugs, which necessitates longer treatment of six-nine months.

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.

3.5 Gene Behind Asthma Uncovered

Why in News?

Based on a study of a four-generation family with high prevalence of asthma, a multi-institutional study by Indian researchers has shown that a variant of an olfactory gene (OR2AG2) is a novel candidate for asthma.

What is a mutation?

- A mutation is a change that occurs in our DNA sequence, either due to mistakes when the DNA is copied or as the result of environmental factors such as UV light and cigarette smoke.
- Over a lifetime our DNA can undergo changes or 'mutations' in the sequence of bases, A, C, G and T.
- This results in changes in the proteins that are made.
- This can be a bad or a good thing.
- Mutations can occur during DNA replication if errors are made and not corrected in time.
- Mutations can also occur as the result of exposure to environmental factors such as smoking, sunlight and radiation.
- Often cells can recognise any potentially mutation-causing damage and repair it before it becomes a fixed mutation.
- Mutations contribute to genetic variation within species.
- Mutations can also be inherited, particularly if they have a positive effect.
- For example, the disorder sickle cell anaemia is caused by a mutation in the gene that instructs the building of a protein called haemoglobin.
- This causes the red blood cells to become an abnormal, rigid, sickle shape.

- However, in African populations, having this mutation also protects against malaria.
- However, mutation can also disrupt normal gene activity and cause diseases, like cancer.
- Cancer is the most common human genetic disease; it is caused by mutations occurring in a number of growth-controlling genes.
- Sometimes faulty, cancer-causing genes can exist from birth, increasing a person's chance of getting cancer.

3.6 Measles Outbreaks

Why in News?

Children under the age of five accounted for most of the 1,40,000 people who died from measles in 2018.

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

3.7 Polio Reported

Why in News?

First case of polio reported in Malaysia after 27 years.

What is polio and how it is caused?

- Polio (also known as poliomyelitis)
- Poliovirus is very contagious and spreads through person-to-person contact.
- It lives in an infected person's throat and intestines.
- Poliovirus only infects people.

- Although there is no cure, there is a safe and effective vaccine

It enters the body through the mouth and spreads through:

- Contact with the feces (poop) of an infected person.
- Droplets from a sneeze or cough of an infected person (less common).

You can get infected with poliovirus if:

- You have feces on your hands, and you touch your mouth.
- You put in your mouth objects like toys that are contaminated with feces.

3.8 Rheumatoid Arthritis

Why in News?

A specific fragment of a protein secreted by the parasitic worm liver fluke (*Fasciola*) has been found to protect the articular cartilage of joints from being destroyed by the body's aberrant immune system, thus preventing rheumatoid arthritis from progressing.

What is Rheumatoid arthritis?

- Rheumatoid arthritis is a chronic inflammatory disorder that can affect more than just your joints.
- In some people, the condition can damage a wide variety of body systems, including the skin, eyes, lungs, heart and blood vessels.
- An autoimmune disorder, rheumatoid arthritis occurs when your immune system mistakenly attacks one's own body's tissues.
- Unlike the wear-and-tear damage of osteoarthritis, rheumatoid arthritis affects the lining of joints, causing a painful swelling that can eventually result in bone erosion and joint deformity.
- The inflammation associated with rheumatoid arthritis is what can damage other parts of the body as well.

What is a liver fluke?

- A liver fluke is a parasitic worm.
- Infections in humans usually occur after eating contaminated raw or undercooked freshwater fish or watercress.
- After liver flukes have been ingested, they travel from your intestines to your bile ducts in your liver where they then live and grow.

3.9 Protein that repairs DNA damage

Why in News?

Researchers have unravelled the working of a protein that repairs damaged DNA.

What causes DNA damage?

- The various types of damage to DNA, including oxidative damage, hydrolytic damage, DNA strand breaks, and others.
- Oxidative DNA damage refers to the oxidation of specific bases.
- Hydrolytic DNA damage involves deamination or the total removal of individual bases.
- Ultraviolet and other types of radiation can damage DNA in the form of DNA strand breaks.
- DNA damage may also result from exposure to polycyclic aromatic hydrocarbons (PAHs).
- The Comet Assay, or single cell gel electrophoresis assay (SCGE), is a common technique used to measure all types of DNA damage.

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.
- The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T).

- Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people.
- The order, or sequence, of these bases determines the information available for building and maintaining an organism

3.10 Roentgenium

Why in News?

Silver jubilee of discovering roentgenium.

What is roentgenium?

- Roentgenium is a radioactive, synthetic element about which little is known.
- It is classified as a metal and is expected to be solid at room temperature.
- Roentgenium has seven isotopes whose half-lives are known.
- The most stable isotope is ^{281}Rg , with a half-life of about 26 seconds.
- It decays through spontaneous fission.
- Roentgenium is produced artificially.
- The team that discovered it bombarded atoms of bismuth with ions of nickel in a linear accelerator to produce element 111.
- Only a few atoms of roentgenium have ever been made, and they have no current application outside of scientific study.