1. What are the locational factors for the pharmaceutical industry? Discuss with the help of suitable examples.

Demand of the question:

It expects students to mention the locational factors for the pharmaceutical industry with relevant examples for the specific location.

Introduction:

The pharmaceutical industry discovers, develops, produces, and markets pharmaceutical drugs for use as medications to patients. Pharmaceutical industry being a major global economic force relies on production of pharmaceutical drugs in a safe, clean and efficient environment, hence location of pharmaceutical industries are selected accordingly.

Body:

The pharmaceutical industry's operating environment is complex because of economic, political, technical, and social influences within a growing global environment for product development and delivery. Though pharmaceutical industry is a footloose industry (i.e. it does not require specific local resources) following locational factors needs to be considered for the pharmaceutical industry:

- Availability of Raw material: An ideal location is one where the main raw material required to manufacture the product is adequately available. This will ensure regular supply of the material and will reduce the transportation costs. e.g. Indian pharmaceutical industry is located near the western coast of India. The ports on western coast help to import raw materials required for the manufacturing of drugs.
- Nearness to the potential market: Marketing of finished goods efficiently is an important function of an enterprise. If the plant is located near the market, then the management can keep close touch with their changes in market environment and formulate its production policies accordingly. Moreover, the transportation and other overhead expenses are reduced. e.g. Indian pharmaceutical industry is located near the western coast of India. Proximity to ports (Kandla, Bhavnagar etc.) facilitates easy export to Africa, Europe etc.
- Location should be near to source of operating power: For some specific operations in industries, cheap, continuous and adequate power supply is needed. Location of the plant near to the hydel-power situation will provide cheap electricity.
- Supply of labour: Labour is one of the most important inputs in any industrial enterprise. There should be regular and cheap supply of labour, specifically the skilled labour. Also, If there is adequate supply of local labour/unskilled labour near the plant, then naturally it will be available at cheaper rates.
- Transport and communication facilities: Transport is very important for bringing raw materials, fuel from different places, marketing of finished products etc. The region well connected with rail, road, water and air

transport system is considered to be more appropriate for the location of the plants.

- Suitability of land and climate: Sub-soil of the location should be able to support the load likely to be placed on it. Similarly, climatic conditions viz humidity, temperature and other atmospheric conditions should be favourable for the plant. For example, humid atmosphere is not suitable for the formation of pharmaceuticals.
- Local building and state policy regulations: Proposed location should not be infringe local regulations and bye-laws. Laws for the construction of buildings, local taxes etc. should be taken into consideration for the selection of site. Favourable state government policies also influence the location of industries, e.g. stable policies of Gujarat, Maharashtra.
- Safety requirements: Industries likely to cause pollution or processes explosives in nature should be located in remote areas.

Considering these locational factors, Indian pharmaceutical industry is located near the western coast where raw material is available, also it is well connected to the market through rail, water, road and air. Also highly skilled as well as unskilled workforce is available.

Conclusion:

The pharmaceutical industry has grown in the last several decades and has become quite complex, promising to deliver valuable products that enhance the quality of life to an expanding global population that demands greater access and more affordable choices. Being the pharmacy of the world, India has shown its potential to be the leading producer in the pharmaceutical industry, with more enhancement in it India can prove to be a global leader in the pharmaceutical industry.

2. During the COVID-19 pandemic, we have witnessed significant shifts in the pattern of investments across the world. Please discuss a few examples along with their causative factors.

Demand of the question:

It expects students to observe and mention the shift in pattern of investment across the world with relevant examples. It also expects to discuss the reasons for the shift.

Introduction:

As per World economic situation and prospectus 2020 of United Nations Conference on Trade and Development (UNCTAD), it is observed that the economic uncertainty sparked by the Covid-19 will likely cost the global economy $1 trillion in 2020.

Body:

Almost all the sectors of the economy are devastated by the COVID-19 impact, in these uncertain times investors chose a durable and safe way to ensure return on investment. Hence, investment patterns changed across the world as follows:

- Investors across the world chose to invest in the most dependable options to invest such as investment in the high value metals is increased in such a way that the prices of gold and silver are skyrocketed.
- For instance, gold touched around 56000 rs. for 10gm and silver cost touched nearly 75000 rs mark for 1kg.
- Industrialists in Europe are re-locating their businesses to South Asian countries like India, Vietnam, etc.
- As health becoming the most important issue in this pandemic, people are investing more in buying medical/health insurances. For instance, Health insurance sector saw a 7% rise in investment relatively with pre-covid19 times.
- People are investing more in the essential commodities markets related stocks.
- Also investment in the E-commerce sector has increased, as people are preferring to stay at home and avoid going out.
- For the first time in the history of the Indian capital markets, Foreign Portfolio Investors (FPIs) have sold securities worth over ₹1 lakh crore in a single month (March 2020).
- Investors also chose to invest in the medical health related product manufacturing and services. e.g. Boom of sanitizer and mask manufacturers is seen across the globe as it was the need of the hour.

Following are the major causative factors for change in investment pattern across the world:

- As COVID-19 infection spreads fast has potential to spread millions of people within less span of time, no medication or vaccine for it has halted all the economic activities as health of people is of prime most importance. Hence, change in investment pattern is observed due to uncertainty of market recovery.
- According to market participants, the ongoing COVID-19 pandemic that has affected stocks worldwide is the primary reason for such record outflows as foreign investors move away from riskier assets and emerging markets.
- The global economic slowdown due to the supply chain disruption and market forces at halt has caused the loss of trust of investors in the earlier traded securities.
- Interest rates: Investment is financed either out of current savings or by borrowing. Therefore investment is strongly influenced by interest rates. High interest rates make it more expensive to borrow. High interest rates also give a better rate of return from keeping money in the bank. As in these uncertain times where people are utilising their hard earned savings for survival, the investment choices of people have changed radically.
- Economic growth: Firms invest to meet future demand. If demand is falling, then firms will cut back on investment. If economic prospects improve, then firms will increase investment as they expect future demand to rise. As COVID-19 has impacted the world economy investors are not willing to take risk, as global economic recovery is far in sight.

- Productivity of capital : Even though if an investor chose to invest in the production process, the profit margin from the investment is not sure and hence, less or no investment is taking place.
- Government policies: Government policy of making containment zones and not allowing interstate , intra-state movement and transport has halted the production capabilities.

Although, it will be unreal to expect the investment trajectory to move upwards very easily post-covid19 crisis, following measures can be implemented to normalise the investment pattern:

- Need of the moment is to expedite the development of vaccine for COVID-19, and swift and wide scale availability of the economy across the globe. So, that people can start their all their works in normal situation.
- A large scale fiscal stimulus for the economies to go back to the earlier market transactions is the need of hour.
- Also customization of approach are also needed as different sectors of economy have impacted differently.
- Issues with the banking sectors are also needed to be tackled. Such as NPA's issues may aggravate the crisis in economy.
- Also providing lucrative investment opportunities for business persons and institutions so that their trust can be rebuild in the economy and further economic progress can be achieved.

Conclusion:

Impact of COVID-19 is unprecedented and the downside is that it has affected almost all the sectors of the economy in a single shot. However, the upside is expedited vaccine development for COVID-19 shows some promising results. Hence, necessary steps needed to be taken as early as possible which will supplement the recovery of economy.

3. How are sustainable technologies shaping the economies of different countries? Discuss. What is the level of maturity of this industry in India? Examine.

Demand of the question:

It expects students to write about the sustainable technologies role in shaping economies of different countries. It also expects to probe deeper in to facts of the level of maturity of this industry in India.

Introduction:

People and their well-being are often the central focus of many scientific and technological endeavours. Sustainable Technology is a technology which improves our social and environmental footprint at every stage of the product life, from raw material extraction to end of life.

Body:

Attesting to this, Sustainable technologies are generating breakthroughs in the field of medicine, electricity, solar power, space exploration, governance, education,

construction etc. Sustainable technologies are shaping the economies of different countries in following ways:

- It ensures efficient natural resource consumption.
- The shift from fossil fuel toward perpetual energy takes place, hence, its relative negative impacts such as pollution like problems are minimized.
- Climate change risk mitigation: Being sustainably conscious, Patagonia has implemented a number of innovations in company management, such as recycled construction materials with laminated coated windows that prevent overheating, LED lighting, new systems of heating, ventilation and air conditioning controlled by a smart grid.
- Supply chain improvement: Walmart, one of the biggest retail corporations in USA represents multiple deployments of digital transformations that work to eliminate wastage and energy usage and to provide supply chain control.
- Patagonia is a sustainable clothing company with $800 million revenue that can boast with using organic materials, selling worn and re-crafted outfits and organic provision. Also, the company provides worldwide fundraising through online banking and keeps an online blog The Cleanest Line where articles are dedicated to environmental crises and solutions.
- Digital innovations with help of renewable energy: The implementation of ambiguous digital transformations, like IoT and AL software, can help to control environmental conditions within the city. For example, saving water, especially in limited desert surroundings, becomes accessible due to smart sensors for water management and rainwater collection.
- Offshore wind turbines equipped with sensors that seamlessly generate valuable data used to build “an entirely green connection” with a 100 % carbon-free energy supplement by 2025. e.g. As done in Denmark by Microsoft and Orsted.

In these versatile ways sustainable technologies are shaping the economies of the world. These technologies are not just shaping the economies but they are transforming these economies into a different era of technological evolution.

Level of maturity of Sustainable technology industry in India:

- From the point of view of government initiatives, Centre for Sustainable Technologies (CST) established as Centre for ASTRA (Application of Science and Technology for Rural Areas) in 1974, is IISc inter-disciplinary research and technology development centre for providing sustainable solutions to host of global concerns.
- CST's diverse interventions are, Energy Efficient Wood Burning Devices, Biomethanation, Biomass Gasification, Alternative Building Technologies, Green Buildings and BiPV, Water Purification and Defluoridation, Sanitation, Sustainable Biomass for Energy, Forestry, Bioenergy & Climate Change, and Environmental Quality Assurance-Impact Studies.
- The spread and impact of technologies emanating from CST over the past three decades have been noteworthy; 1.5 million rural households are using the ASTRA wood burning devices for their cooking needs, adoption of

biomass gasifiers for village electrification and industries is resulting in a daily savings of about 30 tons of fossil fuel.

- Thirty-five biomethanation plants are converting bio-waste into useful biogas and about 12,000 buildings (including 5000 in earthquake affected regions of Gujarat) have been built using alternate building materials developed.
- In agriculture sector, we identify some of the more promising technologies are developed that have the potential to transform agriculture, especially on small holding farms in India, to a low carbon and climate resilient path while maintaining or increasing yields.
- In grid connectivity, The major objective of 'Smart grid mission for India' is to empower the Indian power sector in deploying smart grid sustainable technologies in an efficient, cost effective, innovative and scalable manner by bringing together all enabling technologies and all key stakeholders together under one roof.
- The Government of India has set a target of installing 175 GW of renewable energy capacity by the year 2022, which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro-power. Also International Solar Alliance as proposed by India is in place on global forum.
- India's renewable power installed capacity has reached over 70 GW. Here the sustainable technologies have achieved a considerable target but still miles to go to achieve the set target.

The challenges of sustainable technological development is different in different settings, considering Indian scenario India has initiated and achieved noteworthy heights in sustainable technological development. However, following approaches needs to be adopted to attain heights of excellence.

- Investing more in research and development in the sustainable technological development sector.
- Giving impetus to new ideas and imbibing a culture of scientific approach in students through missions such as Atal innovation mission.
- Supporting the start-ups in the sustainable technological sector by providing them tax concessions, less interest loans and providing platform for the market exposure such as green technological expo.

Conclusion:

Sustainable technology is a newly emerging field in the world economy. As the fossil fuels are limited in nature, emerging sustainable technologies are going be the game changer in the market. Hence, more emphasis on developing these technologies can ensure India to achieve great heights in sustainable technological development just like ISRO's golden achievements in past years.

4. What role do temperate cyclones play in causing precipitation in different parts of India? Explain.

Demand of the question:

It expects students to write in detail the role of temperate cyclone in causing precipitation in different parts of India.

Introduction:

The cyclonic system developing in the mid and high latitude i.e. 35° latitude and 65° latitude in both hemispheres, beyond the tropics is called the Temperate Cyclones or Extra Tropical Cyclones.

Body:

Due to these cyclones, highly variable and cloudy weather is observed in temperate zone. It is in these latitude zones that the polar and tropical air masses meet and form polar fronts, most of these cyclone form wavelike twist i.e. wave cyclone.

Especially with respect to India, temperate cyclones are observed in the form of disturbances known as 'western disturbance'.

- Temperate cyclone is a common weather phenomena in India. Temperate cyclone is an extra tropical cyclone originating in the Mediterranean region that brings sudden winter rain to the north western parts of the Indian subcontinent.
- They are the cause of the most winter and pre-monsoon season rainfall across North-West India (such as Punjab, Haryana, Delhi and western Uttar Pradesh).
- Temperate cyclones, specifically the ones in winter, bring moderate to heavy rain in low-lying areas and heavy snow to mountainous areas of the Indian Subcontinent.
- This phenomenon is usually associated with cloudy sky, higher night temperatures and unusual rain.
- This precipitation during the winter season has great importance in agriculture particularly for rabi crops including wheat. It is estimated that India gets close to 5-10% of its total annual rainfall from temperate cyclones.
- Also, Saffron cultivation along with tea cultivation in the foothills of Himalayas is depending on the western disturbance.
- Over the Indo-Gangetic plains, they occasionally bring cold wave conditions and dense fog.
- Western disturbances very less likely cause precipitation in the southern i.e. peninsular part of India.

Conclusion:

Most of the North and North-western India's Rabi crops yield better results because of the Temperate cyclones. Temperate cyclones provide the rain for most of the North and North-western India and fill the vacuum created by South west monsoon and also play a pivotal role in water need for human consumption and agriculture sector.

5. With the help of suitable examples, discuss the endogenous factors that lead to the formation of volcanoes.

Demand of the question:

It expects students to give detailed account of how the endogenous factors lead to formation of volcanoes with suitable examples.

Introduction:

The horizontal and vertical movements caused by the forces coming from the origin of the earth is known as endogenic forces. The origin of endogenic force is caused by the contraction and expansion of rocks due to variation in thermal conditions and temperature inside the earth. These forces are responsible for creation of many landforms one of such landform is volcano.

Body:

Endogenic factors that lead to formation of volcanoes:

- The ultimate source of energy behind forces that drive endogenic movements is earth's internal heat.
- Endogenic movements are divided into diastrophic movements and sudden movements.
- Plate Tectonics: The majority of volcanoes occur where two lithospheric plates converge and one overrides the other, forcing it down into the mantle to be reabsorbed.
- Ocean floor spreading: A major site of active volcanism is along the axis of the oceanic ridge system, where the plates move apart on both sides of the ridge and magma wells up from the mantle.
- Weak Earth Surface: Because of high pressure in the earth's interior, the magma and gases escape with great velocity as the pressure is released through eruptions where opportunity is provided by weak zones along the earth's surface.
- Faults: Whenever extreme pressure builds in the mantle, along fault lines an eruption is likely to happen next. The earthquakes, for instance, may expose fault zones through which magma may escape and volcanoes can be formed.
- Magma crystallization: Decreasing temperatures can cause old magma to crystallize and sink to the bottom of the chamber and this movement can force fresh liquid magma up and out – similar to dropping a brick in a bucket of water.
- Plate movement: Volcanism may occur because of plate movement over a "hot spot" from which magmas can penetrate to the surface. e.g. Islands of Hawaii

Conclusion:

Through these endogenic factors volcano formation takes place. Depending on the level of activity volcanoes are further classified as Active, Dormant and extinct. Apart from playing a prominent role by giving cooling effect to most part of earth, volcanoes also contribute Ash and lava which breaks down to form soil and rocks.

6. What do you understand by storm surge? How does a storm storm surge get formed? Discuss.

Demand of the question:

It expects candidates to write their understanding about storm surge. It also expects to write the mechanism of formation of storm surge.

Introduction:

Storm Surge is an abnormal rise of sea level as the tropical cyclone crosses the coast. The storms produce strong winds that push the water into shore, which might lead to flooding.

Body:

Storm surge depends on intensity of the cyclone (Maximum winds and lowest pressure associated with it and Coastal bathymetry (shallower coastline generates surges of greater heights). Following is the way of formation of cyclone:

- When a cyclone is in deep ocean waters, the circulating wind pushes the ocean surface to create a vertically circulating column of water, where the surge is barely visible.
- However, as the storm moves closer to the shore, the water which is being pushed downwards by the wind cannot move any lower, so the water forces itself from the sides towards land, causing a storm surge wave.
- Although low pressure also contributes to the surge, its influence is very small, i.e., around 5%.
- Whenever a cyclone moves near coastal areas, storm surges are the biggest and most common threat to life and property.
- This phenomenon is commonly found in low-pressure systems, and the severity of the storm surge wave depends on the tides, shallowness of the water in the area, and the angle at which the water is to the cyclone.

Following are some factors which determine the intensity of storm surge:

- Strength and Size of the Storm: During a cyclone, the water level rises to form storm surges, where the strength and speed of the winds are the highest. Usually, the largest surges occur in the direction of where the wind is blowing. Due to the rotation of the earth, the surge occurs towards the right side of the cyclone in the northern hemisphere, and towards the left side in the southern hemisphere.
- Atmospheric Pressure: The force exerted by the atmospheric pressure is a smaller factor in the formation of a storm surge.
- Bottom Conditions Near Shore: Another minor factor determining the strength of a surge is whether the coastal slope is steep or shallow, and rough or smooth. A shallow and smooth ocean floor near the coast can dramatically enhance the speed and power of the storm surge, while a steep climb with rough obstructions can slow and sometimes even stop a storm surge. A wider shore will have a higher surge than a narrower shore.
- Distance from Storm Centre to Shore: For a storm surge to achieve maximum potency, the distance between the eye of the storm and the shore should neither be too close nor too far. If the distance is less, the surge cannot

gather enough velocity to gain power. However, if the storm is too far, the surge will lose its gathered energy by the time it reaches the shore.

- Tides: The gravitational force of the sun and moon cause low and high tides. If the storm surge occurs during a low tide, the intensity will be significantly reduced. However, a storm surge during high tide will cause a storm tide capable of heavy destruction.
- Freshwater: Usually, before a storm reaches land, most coastal areas receive heavy rainfall, causing water levels to rise. This is especially true in areas that have a river delta, causing bigger and stronger storm surges.
- Shape and Angle of Coast to the Storm: A shore with a convex shape will have a lower surge as compared to a concave shore. Also, if the storm is moving parallel to the shore, it will cause lower and weaker storm surges as compared to a storm moving perpendicular to the coast.
- Sea Waves: When waves break onto the beach, they may collect into pools, eventually making it easier for the surge to overcome the friction of the beach, and move even further inland.

A storm surge should not be misunderstood as seiche, as Storm surge is the unusual rise in the water levels generated by a storm over and above the predicted astronomical tide. The term seiche can be defined as a wave on the surface of a lake or landlocked bay; caused by atmospheric or seismic disturbances.

Conclusion:

Storm surge as high as 15 to 20 ft. may occur when all the factors contributing to storm surge are maximum. This storm tide inundates low lying coastal areas which have far reaching consequences apart from flooding. Hence, necessary precaution if taken will ensure the minimal loss of environment human life in the surrounding area.

7. With the help of suitable examples, examine the pattern of losses of ice bodies in different parts of the world.

Demand of the question:

It expects students to put clear data about the pattern of losses of ice bodies in different parts of the world.

Introduction:

As a consequence of industrial revolution and technological developments aftermath the phenomenon of loss of ice bodies in different parts of the world has gained pace. The impact that this event is having on earth is really dangerous and is increasing every day.

Body:

Pattern of losses of ice bodies in different parts of the world:

Himalayan Region: Melting of glaciers

- The Himalayas is considered as the Third Pole. Within it, the core area is known as the Hindu Kush Himalaya (HKH) region.
- According to an international study on the world's glaciers published in journal Nature Geo-science, glaciers are melting and receding at an alarming rate in the Himalayas and glaciers in the HKH might contain 27 per cent less ice than previously suggested.

Antarctica: Retreating of glaciers

- Antarctica encompasses land, island and oceans south of 60° latitude. This region stores about 70% of the world's fresh water in the form of snow and ice.
- The World Meteorological Organisation (WMO) has confirmed that the region is one of the fastest warming regions of the planet. Over the past 50 years, it has warmed over 3°C.
- The annual ice loss in the Antarctic region has increased at least six folds between 1979 and 2017.
- 87% of glaciers along the West Coast of the Antarctic Peninsula have retreated in the last 50 years with most of these showing accelerated retreats in the past 12 years.

Arctic and Antarctic region: Glaciers Melting from the Bottom

- Glaciers in Greenland and Antarctica are losing ice at alarming rates, and warmer air isn't the only cause.
- Scientists increasingly agree that warm ocean water is seeping beneath the ice and melting it from the bottom up.
- Breaking of Larsen C ice shelf in Antarctica and several smaller ice shelves in the Arctic are a result of global warming.

Ice mass loss in the Russian Arctic:

- Ice mass loss in the Russian Arctic has nearly doubled over the last decade according to Cornell University research published in the journal Remote Sensing of Environment.
- Glaciers there are shrinking by area and by height. We are seeing an increase in the recent speed of ice loss, when compared to the long-term ice-loss rate.

South America:

- The 18,000-year-old Chacaltaya glacier in the Bolivian Andes disappeared.
- In Ecuador, an avalanche at the base of the Cayambe glacier occured. Also, an avalanche caused serious damage in the area of Pampa Linda.
- These isolated avalanches confirm the trend towards the collapse of the Andean glaciers.

This kind of varied pattern of loss of ice bodies is being observed over the world. Global climate change has already brought about immediate observable effects on the planet. Glaciers have shrunk, ice is melting world wide – especially at the North

and the South Poles. This includes mountain glaciers, ice sheets covering Antarctica, Greenland and the Arctic sea ice. Hence, this issue needs a serious attention to save our planet earth.

Following necessary steps can be taken to contain the ice bodies loss:

- In order to stop the temperature from rising, the only solution is to cool the planet as advised by the scientists. For this, the world not only needs to slow down greenhouse gas emissions but also reverse them.
- In this direction a step is taken to prevent the severe effects of climate change, the UN signed the Paris agreement in 2016, an international treaty designed to keep the average global temperature well below 2°C above pre-industrial levels until greenhouse gas emissions are reduced.
- There are 1,98,000 glaciers in the world and India alone has about 9,000 of them. However, all of these glaciers are mostly unexplored. More detailed research is required to fully understand the state of glaciers and the risk their loss poses.

Conclusion:

While immediate action is needed to save the earth, it is not too late to do something about it either. It may be important to revisit the commitments of global climate change before it is too late, as the changes that have already set in due to climate change might continue to cause damage for a several decades, even if solid measures are taken to contain the changes.

8. What is Mascarene High? How does it impact the weather pattern in the Indian subcontinent? Explain.

Demand of the question:

It expects a candidate to give a clear account of Mascarene high and its importance in the weather pattern of Indian subcontinent.

Introduction:

This high-pressure region located between 25°S-35°S and 40°E-90°E near the Mascarene Islands in the southern Indian Ocean is a source of Southwest monsoon in India. Since, it is a high pressure are, it is also known as Mascarene high.

Body:

Normally, the high-pressure region starts forming by mid-April and its strength is an important factor which determines the intensity of monsoon in India. its impact on the weather pattern in India is as follows:

- A stronger high pressure will produce stronger winds or monsoon current.
- If there is a delay in the formation of Mascarene High, there is also the possibility of a delay in the onset of monsoon in India.
- Most research says that its strength is determined by the happenings in the Antarctic region.
- The position and intensity of this high are considered to be closely linked to the south summer monsoon activity.

- But overall, this factor is not often held responsible for delays and poor performance of the monsoon in India. Following figure 1 represents the region of Mascarene high.

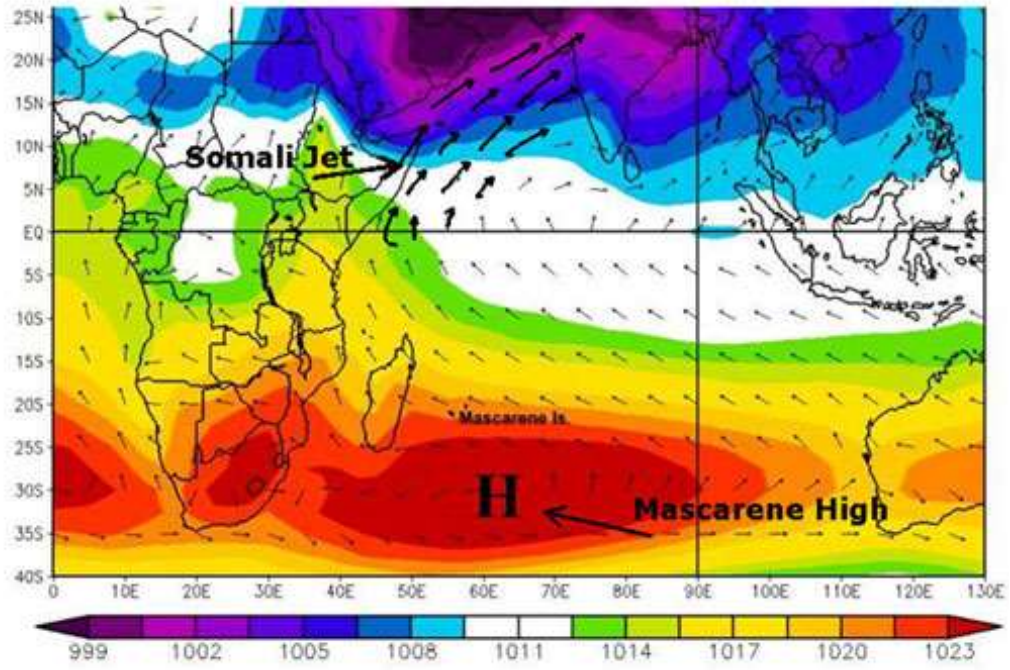

Figure 1

- According to scientists, the broad belt of high pressure around the Mascarene Islands generates a cross-equatorial flow known as the Somali Jet which brings heavy rain to India's west coast. A strong, low level jet usually means a strong monsoon over peninsular India.
- Winds from Mascarene High head in a north-westerly direction towards the east coast of Africa (Somalia). Here, the topography of Somalia deflects the winds towards the east. Also, after crossing the equator, these winds experience the Coriolis Effect.
- Coriolis Force is a pseudo force which exists only because of the Earth's rotational effect. Rotational motion observed in a tropical cyclone is also due to this force.
- Hence, these monsoon winds get deflected eastwards and now they blow from south-west to the north-east direction. They split into two branches—the Arabian Sea branch and the Bay of Bengal branch.

In this way Mascarene high impacts the weather pattern in India by creating a way and safe passage for the arrival of monsoon winds in India.

Conclusion:

Since, south west monsoon plays the most prominent role for water availability in India. The role played by Mascarene high also needs to be understood well by investing more in research and developments related to the mechanisms along Indian ocean and Mascarene high.

9. Examine the impacts of global sea level rise on the costal flora and fauna.

Demand of the question:

It expects candidates to probe deeper into the impacts of global sea level rise on the coastal flora and fauna.

Introduction:

As per the fifth assessment report of the United Nations Intergovernmental Panel on Climate Change (UNIPCC), the global sea level is rising at an average rate of 8 mm per year over the last century.

Body:

The impacts of sea level rise are numerous. The most worrying aspect of the report, however, is not this increasing figure, but its foresight: "Sea level is rising faster than 50 years ago and is likely to worsen in the future." Hence, it becomes imperative to understand its impact on the coastal flora and fauna to tackle it.

Impacts of global sea level rise on the costal flora and fauna:

- Water is increasingly invading coastal areas, causing soil erosion and threatening farmland, housing or recreation areas.
- The flooding of wetlands and pollution of aquifers also occur, affecting the flora and fauna of each place, causing the loss of habitat for fish, birds, plants and many other species.
- Low-lying islands would be swallowed by the oceans, leading to the disappearance of large land areas and even some countries.
- As a consequence of loss of habitat, the Earth could witness a dramatic decline in fish stocks.
- It is also going to impact the breeding season and pattern of the coastal flora and fauna.
- Most of the oceanic creatures travel long distances to reach for a suitable breeding ground. Due to sea level rise these breeding grounds may start to disappear and submerged under the ocean. e.g. Ollive ridley turtles breeding ground off the coast of Odisha and west Bengal.
- Plantation agriculture across the oceans are going to be hampered. e.g. Coconut plantation, palm plantation across the oceans.
- Animals are facing the threat of extinction due to melting of ice over the glacial regions. e.g. Polar bears home in Arctic regions may disappear as a result it might face extinction due to loss of habitat and no adaptability of body type in melted glacier region.
- Due to constant rising sea level, many small atolls (circular coral colonies) of Indian archipelago are sinking. Parali I Island of Lakshadweep has already sunk and Parali II has sunk almost 80% of its total area.
- Rising sea levels can exacerbate the impacts of coastal hazards such as storm surge, tsunami, coastal floods, high waves and coastal erosion in the low lying coastal areas in addition to causing gradual loss of coastal land to sea.

- UNIPCC in its fifth report has stated that sea level in Lakshadweep has risen up to 0.6 m in last 20 years. This will not only cause loss in livelihood to the native people but also loss of biodiversity as large number of flora and fauna inhibit these Islands along with Particularly Vulnerable Tribal groups (PVTGs).
- Mangrove forests across the shore which acts a barrier against devastating high levels of tides also face threat of submergence under coastal water rise. It might aggravate the tsunami like disasters impact on the coastal population.
- It's not just about the sea level rise affecting coastal areas flora and fauna, the rising sea level is going to increase the amount of rainfall over the earth, due to which the flora and fauna in the forested regions also face threat of extinction due to tremendous amount of rainfall over the region making plants and animals hard to survive.
- Rising sea level in coastal regions is also going to hamper the food availability for the fauna in the nearby areas.
- Also due to impact on the fauna, insects which are necessary for the pollination might get extinct. It will in turn affect the life cycle of flora too.

Ways to tackle impact of sea level rise on the coastal flora and fauna:

- Greenhouse gasses are a major contributor to sea level rise. By reducing the amount of greenhouse gases produced every year and formulating measures to contain it will be useful to minimize the sea level rise.
- Protect wetlands: Wetlands act as natural buffers for coastal areas during rainstorms and hurricanes. They absorb precipitation and storm surge waters.
- Plant more plants and save trees. Plants clean the air and soak up rain. Reduce paper use to prevent trees from being cut down.
- Reduce energy use. Reducing energy usage is good for the environment.
- Push for a Climate Action Plan. Many cities and states do not have plans to address climate change, which is the primary cause of current sea level rise. Hence, preparing a climate action plan for the city to international level will synchronize the efforts to tackle the sea level rise.
- The Sunrise Movement in USA is pressuring candidates to adopt a Green New Deal. There are 500 candidates who have vowed not to accept campaign contributions from the oil industry.
- Also there is need for an international level alliance and agreement like Paris climate deal that specifically dedicated to look in to matter of sea level rise.

Conclusion:

The threat of sea level rise is near and real. If necessary steps are not taken at this moment then it might result in the destruction of the not only the coastal environment and surrounding but the domino like effect will follow which will affect whole the planet earth. Hence, it become our responsibility to take a step forward to save our mother earth.

10. What are tides? How do tides form? Explain. What is the significance of tides for marine ecology? Discuss.

Demand of the question:

It expects candidates to write about the tides and mechanism of their formation. It also expects to write how tides play an important role in marine ecology.

Introduction:

Tides are the periodic rise and fall of the oceans water level, once or twice a day, caused by the combined effects of the gravitational forces exerted by the sun, the moon and the rotation of the earth.

Body:

Formation of tides:

- Combined effects of the gravitational forces exerted by the Moon and the Sun and the rotation of Earth cause occurrence of tides in oceans.
- Hence, the mechanism of tides formation could be understood by understanding the gravitational force of the Sun and the Moon.
- These bodies experience the gravitational pull over each other depending upon their mass and the distance between them.
- Since the Sun is far away from the Earth as compared to the Moon. Hence, the Sun's gravitational pull is lesser over the Earth than the moon. Thus, the moon determines the magnitude of the tide.
- It is supposed that only the water bodies are pulled by the gravitational pull, however, it is not the fact.
- It is both the land and water bodies that get pulled by the gravitation. Since the relative pull of the land is less in comparison to that of water, the effect of gravitation on the water bodies is more.
- Following Figure 1 represents mechanism of tide formation.

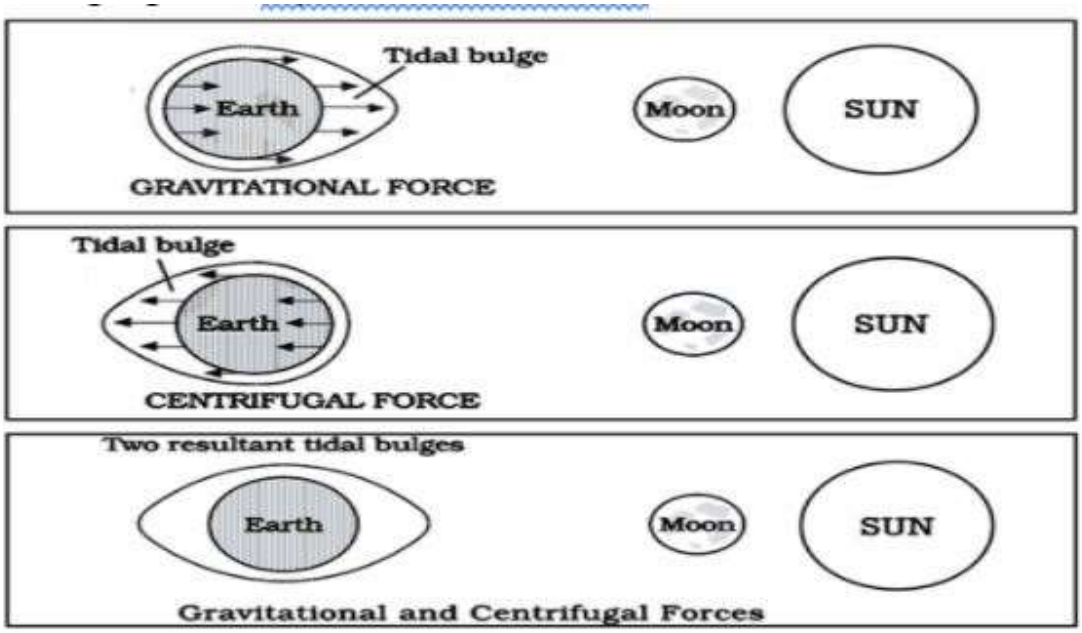

Figure 1

Significance of tide for marine ecology:

- Marine ecology is the study of living things in the ocean and how they interact with their environment.
- Sustenance of life: Tides affect various aspects of oceanic life, including the reproductive activities of fish and ocean plants. Floating plants and animals ride the tidal currents between the breeding areas and deeper waters.
- Source of habitat and food: Sea creatures like Crabs, mussels, snails, seaweed etc. inhabit the tidal zone and the most important point to be remembering that without the regular washing of the tides, these complex and abundant creatures would die and food resources would diminish.
- Moderate temperature: The tides and tidal currents mix arctic water that can't absorb sunlight when compared with warmer tropic water that does. Tides stir the ocean water that makes habitable climatic condition and help in maintaining the temperatures around marine ecological habitat.
- Tides removes pollutants and circulate nutrients required for survival of ocean plants and animals. e.g. Seawater in and out of tidal bays and estuaries.
- Tides play vital role for the growth and formation of mangroves, its canopy and formation of zone in the mangrove ecosystem and associated diversity.
- Tides also help to maintain mudflats that provide habitation for flora and fauna.

Conclusion:

In this way tides play an important role by contributing for sustenance of vital life processes around the marine ecology and helps to conserve the rich biodiversity of the marine ecology of planet earth.

11. What do you understand by Business Process Outsourcing (BPO)? What were those factors that made India a hotspot for BPOs? What is the future of BPOs in India? Examine.

Demand of the question:

It expects candidates to write about what they understood by the term Business Process Outsourcing (BPO). It also expects to write about characteristics of India due to which hotspot for BPOs was created and the future of BPOs in India.

Introduction:

Business process outsourcing (BPO) is a method of subcontracting various business-related operations to third-party vendors. Although BPO originally applied solely to manufacturing entities, such as soft drink manufacturers that outsourced large segments of their supply chains, BPO now applies to the outsourcing of services, as well.

Body:

Many businesses, from small startups to large companies, opt to outsource processes, as new and innovative services are increasingly available in today's ever-changing, highly competitive business climate. The Business Process Outsourcing industry in India caters mostly to Western operations of multinational corporations. Annual revenues from BPOs are around $11 billion, around 1% of GDP.

Factors that made India a hotspot for BPOs:

- Availability of Cheap labour: Initially, India was chosen as an apt alternative to in-house processing considering many favourable factors including large English-speaking workforce and availability of tech-savvy manpower.
- Cost advantage: it is the operational cost reduction by outsourcing the business process services to India that makes the country a suitable destination. Companies are enjoying as much as 50-60 percent of cost reduction by outsourcing to India.
- Competent Talent Pool: Despite the stiff competition from The Philippines, Vietnam and other Asian countries, the Indian BPO industry still remains an attractive destination because of the availability of vast skilled labor and their proficiency in understanding progressive technology.
- Leveraging Cost-advantage From Tier II Cities: The existence of a large number of tier II cities in the country is the biggest advantage for the Indian business process outsourcing companies which find working in such cities to

be cost-effective. Besides, the mounting cost of living in these cities has forced the companies to begin operations in the rural regions as it seemed to be promising to significantly reduce the overhead costs in the long run.

- Human Resource Advantage: Though some of the Asian countries are rising to be at par with India in providing cost-effective BPO services, these countries lack sufficient human resources to cater to the global market. India, on the other hand, with its large competent professionals is driving the BPO industry, thereby proving it to be an ideal destination for outsourcing services.

Future of BPO's in India:

- The rapidly growing industry requires growth in infrastructure as well. However, this is an area where India lacks, and this issue need to be addressed to keep up with the competition.
- Even though India has been established itself as a world leader in the business of outsourcing, in the near future, there are chances of facing tougher challenges. South-Asian countries like Malaysia, Indonesia, Singapore, Vietnam, Philippines, Thailand and others are trying to improve their position so as to become alternative offshore locations.
- Companies are branching out to Tier II cities where they would be able to take advantage of low labour costs.
- Other South-Asian countries have been able to challenge the competitiveness of India by offering cheaper labour in business processing skills. India, on the other hand is experiencing a rise in the labour costs along with high attrition which is of course of concern and thereby need to be addressed as soon as possible.

Despite these challenges following Interesting facts about the Indian BPO industry make the industry more attractive destination for investment:

- The BPO sector in India is estimated to have reached a 54 per cent growth in revenue.
- The demand for Indian BPO services has been growing at an annual growth rate of 50%.
- The BPO industry in India has provided jobs for over 74,400 Indians. This number is continuing to grow on a yearly basis. The Indian BPO sector is soon to employ over 1.1 million Indians
- Indian BPOs handle 56% of the world's business process outsourcing.
- Also Ministry of Electronics and IT has started India BPO promotion scheme and North East BPO Promotion Scheme, which aims to aims to incentivize establishment of BPO firms and their extension to Tier II and Tier III cities (as per census 2011) to provide employment, distributed across various states in proportion to population of state with financial support in form of Viability Gap Funding (VGF).

Conclusion:

BPO as its a footloose industry can be set up anywhere, and it has a tremendous potential for growth and development in the Indian market and hence, if the respective policies and schemes implemented in right manner then India can surely emerge as a global leader in the BPO sector.

12. How do changes in the pattern of the Asian Monsoon affect various parts of the world? Explain with the help of recent examples.

Demand of the question:

It expects candidates to write in detail the effect of change in pattern of the Asian monsoon on various parts of the world with relevant recent examples.

Introduction:

The Asian monsoon is one of the most vigorous climatic phenomena on Earth and also one of the most societal important. The monsoon drives vital seasonal rainstorms that water crops and forests as well as damaging typhoons and floods

Body:

In a typical year, 80%–85% of the rain in the affected regions, often totalling 1.5–2.5 meters, falls during the summer monsoon season. On longer timescales, scientists have often cited the evolution of this seasonal wind flow over millions of years as one major cause of past changes in the environments, biosphere, and oceanography of this region, which includes the Indian subcontinent, Southeast Asia, China, Korea, and Japan. Following changes are observed in the pattern of the Asian Monsoon:

- The onset of the monsoon has been delayed almost every year since 1976, when there was a regime shift in climate around the world – from a weak to a strong El Niño period.
- Monsoons have also been ending sooner – almost a week from the end of September – so the length of the rainy season has been compressed.
- During the monsoon season, there are usually random “break periods” when there is hardly any rainfall. These periods are associated with systems moving northwards from the equatorial region. All available data and models-blended-with-data (known as reanalysis) indicate that global warming is shortening the length of the “active periods” when it does rain, while lengthening the break periods.

Effect of change in pattern of the Asian monsoon on various parts of the world:

- Indian monsoon is considered a ‘textbook phenomenon’ clearly defined which has not changed much in the preceding century.
- However this process has hit an erratic front, with floods in the northwest and the northeast and rainfall deficit in southern part of the nation.

- Rainfall extremes have increased threefold over the last few years and now extend over all of central India – from Gujarat to Odisha.
- Onset of monsoon has delayed every year since 2002 and it also lasts for shorter duration, compressing the Indian monsoon.
- The interspersed breaks in the monsoon have increased resulting in larger drier periods in the monsoon itself.
- Rainfall intensity, duration, frequency and spatial distribution have significantly undergone change in the past decade or two.
- Cycles of droughts and floods have become more common in many parts of India and their intensity has changed over the time. e.g. Cyclone Amphan.
- Also now cyclones are also started to occur on the western coast of the countries. e.g. Cyclone Vayu.
- Areas that have traditionally received plenty of rainfall are often remaining dry, while places that are not expected to get a lot of monsoon rain have sometimes been getting flooded.
- The intensity and amount of rainfall over the region has increased drastically. For instance, Typhoon Kammuri in Phillipines and Flooding in parts of China.
- The agricultural cycle of sowing to harvesting is facing tremendous challenge as unprecedented breaks and excess rainfall in short period of time making difficulty to set sowing pattern.
- Many of the metro cities are receiving excessive rainfall as compared to their average normal. e.g. Recent flooding in Mumbai.
- Also some experts opined that Australian bushfires partly due to late monsoon ending in India.
- The lack of water in other areas has hit water table levels. By 2030, India is expected to require almost 1.5 trillion m3 of ground water, where the current supply is only 740 billion m3, putting a huge pressure on the river basins, which are facing challenges of their own due to fast-disappearing glaciers and reduced rainfall.

In recent times it is proved that monsoons are (nearly) unpredictable natural disasters. Hence, following steps are needed to tackle this crisis:

- Need to change crop cycles, credit cycles, create storage infrastructure to deal with flooding.
- We need to invest in developing the state of the art technology to predict the accurate data regarding the monsoon cycle.
- Also, we need modification in the approach of handling of disasters by NDRF and SDRF as the intensity of the rainfall is extreme in some cases.
- Change in the type and variety of crops and change in the kind of inputs used by farmers to deal with the altered reality is needed of the hour.

Conclusion:

The effect of change of monsoon cycle over different parts of the world is wide scale. However, adoption of state of the art technology and investing more in research to know how the change in Asian monsoon will surely help to tackle this challenge successfully and avoid any loss in future.

13. "The true enemy of good isn't evil, but fear. Evil will battle good, but fear will corrupt it". Comment.

Demand of the question:

It expects candidates to write about how fear is the true enemy of good as evil can fight with the good but fear leaves greater impact on good by corrupting it. It also expects to write how overcoming the fear will help to supplement the good.

Introduction:

At the basic level fear guides our fight or flight responses and helps to keep us safe and alive. Fear heightens our senses and awareness; it keeps us alert and helps in better preparation. However, the other side of fear is that it holds us back from doing something positive.

Body:

Fear is a feeling or sense that imbibed in to the mind of a person due to certain danger of threat to his or her life or any other precious-valuable thing in his/her life.

- When a person tries to do some good in the society he/she may have to face fear due to numerous problems. e.g. A person who runs an old age home and runs it through charity of people, might face fear due to demand of money by some local goons.
- In this scenario the fear of survival if overpowered might lead to closure of old age home. This in turn has corrupted the good.
- Fear to speak against corruption acts will not only question the moral standards of a person but it will also pose a question on the integrity of that person.
- For instance, a civil servant is well aware of corruption in her/his department, but chose not to speak against it, in the fear that she/he might lose her/his job.
- Fear to act against unjust will question the courage of the person and will pose a threat to the survival of good by corrupting it. e.g. Onlookers seeing a girls getting molested and acting in silence cowards who are fearful of speaking out.

Hence, it becomes imperative to overcome fear if we want a free, fair and just society. Overcoming the fear will not only help to do good but also it will help it to save good from getting corrupted.

- Martin Luther king jr. spoke against the racial discrimination and demanded an end to racial segregation in the USA, also asked for equality in jobs and civil rights. This mere act of speaking against injustice without fear has culminated in to good for the people of African origin in the USA.
- Ashok Khemaka, IAS has been transferred 53 times, due to the fact that he spoke and stood up against the corruption in various departments. This mere act of courage shows the innate good nature of speaking against corruption without fear.

- This act of speaking against corruption has helped in two ways, as it never let a person's spirit down to act against evil and it also helped to have a greater impact for welfare of the disadvantaged sections of people.
- Hence, overcoming fear will not only help to do good but it will also help to remove out the corruption in good.

Conclusion:

While speaking about the fear Mahatma Gandhi has once said that all fear is the baseless fabric of our own vision. Therefore, Removing the fear from the minds and speaking-acting for good will help to have a harmonious societal life.

14. "You will never attain integrity if you lack the courage to stand up for what you believe is right". Do you find this quote relevant for the civil servants? How? Substantiate your views

Demand of the question:

It expects a candidate to write about the importance of courage to attain integrity when a person stands up for what he/she believes is right. It also expects to write about the relevance of courage for civil servants with relevant examples.

Introduction:

Having courageous integrity means being true to our values (or the values of the institution we belong to), even if that means overcoming the fear of the consequences for doing so.

Body:

Integrity constitutes adopting similar standards or moral principles in similar situations across time and interested parties. Whereas courage comes in to picture when one has the confidence to act or behave in accordance with one's beliefs or ideologies, especially in the face of resistance, criticism, or prosecution.

- For instance, Mahatma Gandhi believed in the value of Non-violence and stood for it even in the times of adversity. In result A strong movement rose in resistance to the oppressive British rule and culminated in to Independence for India.
- This in turn ensured the integrity and courage to stand for it resulted in good for India.

Relevance for civil servant:

- Creates credibility : It helps a civil servant to be trustworthy and get lots of respect in the career because honest and courageous people who stand up with integrity are really trusted by others.
- Leadership: This principle is articulation of the same idea as I referred in the context of Mahatma Gandhi's Experiments with Truth.
- A true leader will always lead by own example. If a leader is courageous and stands up for what she/he believes in then the vibes created percolate down

the hierarchy, cleansing the system that she/he controls. By bringing transparency in the system and standing against corruption.

- A civil servant is required to implement the orders of government without bias, with honesty and without fear or favour.
- It is precisely in this area that a degree of a difference of opinion begins to emerge between the political executive and the civil servants. But if that civil servant stands up in courage for what he/she believes is right then it will ensure integrity not just for him/her but in the system too.
- For instance, Retired IAS officer Mahesh Zagade once met with such a situation while signing the tenders for new road construction. Where after analysing all facts he came to conclusion that it will be an unnecessary expenditure of public money on the well built roads. It led to conflict between him and some regional political leaders, but he stood firm courageously on the value on avoiding unnecessary expenditure of public money and rose victorious.
- It Improve work culture and motivate subordinate officers to be courageous and stand up for what they believe.
- It helps in taking bold decision: For instance, Whistleblowers need courage of conviction to disclose information.

Conclusion:

Courage to stand up for what one believes is of great importance for civil servant in governance as it would have a major impact on the everyday lives of the people and it ensure integrity by continuation of policy of honesty in the governance.

15. Who is your favourite contemporary moral thinker/ philosopher? How do his/ her ideas impact you? Explain.

Demand of the question:

It expects candidates to write about their favourite contemporary moral thinker/ philosopher. It also expects to write about the impact of those ideas on to you.

Introduction:

The world has witnessed some amazing people, who not only challenged the way of life of the contemporary society but stood for their own values and brought miraculous change in the society. One such name is Mohandas Karamchand Gandhi i.e. Mahatma Gandhi, our beloved 'Bapu'.

Body:

The greatness of Mahatma Gandhi lies not only in his heroic struggle for India's freedom, but also in his struggle to live with his own ideas of truthfulness such as Non-violence, Sarvodaya etc. Mahatma Gandhi propounded some amazing ideas in the times of chaos, stood for them and yielded better result for Indian society and world. His following ideas have a greater impact on me.

- Ethical Conduct: Mahatma Gandhi believed that as human beings, men can never reach the perfection of divine virtues. Still, they should strive with all

their strength to follow the virtues of truth, love, nonviolence, tolerance, fearlessness, charity and service to mankind.

- Truth: Mahatma Gandhi equated God with truth and designated his religion as religion of truth. He used to say God is Truth, which he later changed to "Truth is God". However, his idea of truth was not taken from epistemology or theory of knowledge. Rather, he viewed truth in the form of an ideal of human conduct. He regarded that Indian struggle for freedom stands for truth and represents a just struggle for national and individual autonomy.
- Service to Society: Service to the Society was another way in which Mahatma Gandhi's concept underpins his practical actions. He believed that "only way to see God is to see him through his creations and identify oneself with it". This is possible through service to humanity. He maintained that there is no escape from social service to those in search of God.
- Cleanliness: Gandhi emphasised on internal (mental) and external (physical) cleanliness. There was no litter or dirt or filth in his Ashrams and surroundings. He said: "Cleanliness is next to Godliness".
- Ends and Means: Mahatma Gandhi believed that Men should adopt only good means to attain noble objectives. As per him: "No good can follow from bad deeds, even if they are well intentioned."
- Ahimsa: Gandhi's Ahimsa was not only refraining from killing but also show love for the whole mankind and all living beings. He believed that Man can only realize God by pursuing Ahimsa.
- Satyagraha: Mahtam Gandhi's later work rested largely on a spiritual principle of satyagraha that he developed while working in South Africa..

These innovative ideas left a miraculous impact on me in following ways:

- The value of ethical conduct teaches us to be ethical while acting in day to day life, as it will ensure the good for all.
- Mahatma Gandhi equated truth with god. Being an aspirant for civil services, the value of truth teaches me to act truthfully in day to day life. As it is the core value and symbol of right way of life.
- The value of Ahimsa i.e. Non-violence has tells us that we should not resort to violent means to attain our goals. As Mahatma Gandhi rightly pointed out that truth and non-violence are inseparable and truthfulness and fearlessness is prerequisite for a pursuit of Ahimsa.
- Mahatma Gandhi's conception about the Ends and means tells us that we should always look for good path to attain what we want. As attaining bad path to get what we want is wrong.
- Mahatma Gandhi's thoughts about cleanliness aware me about my responsibility towards environment. It helps me to act as a more responsible citizen.
- Through the value of service to society Mahatma Gandhi tells us to serve the society in every possible way. A small act of kindness can also be a service to society.

Conclusion:

In the field of moral thinking Mahatma Gandhi is considered as epitome of moral thinking. His ideas are not just relevant today but they act like a beckon of light in the times of darkness for us and will continue to act in the same way for future generation.