

ENVIRONMENT

PYQs **2011-2025**

(Part -2)



CLIMATE CHANGE



Q. Consider the following statements:



Statement I:

Article 6 of the Paris Agreement on climate change is frequently discussed in global discussions on sustainable development and climate change.

Statement II:

Article 6 of the Paris Agreement on climate change sets out the principles of carbon markets.

Statement III:

Article 6 of the Paris Agreement on climate change intends to promote inter-country non-market strategies to reach their climate targets.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement II and Statement III are correct and both of them explain Statement I
- (b) Both Statement II and Statement III are correct but only one of them explains Statement I
- (c) Only one of the Statements II and III is correct and that explains Statement I
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- Article 6 of the Paris Agreement assists governments in implementing their NDCs(nationally determined contributions) through voluntary international cooperation. Under this mechanism, countries with low emissions would be allowed to sell their exceeding allowance to larger emitters. However, there will be an overall cap of greenhouse gas (GHG) emissions, ensuring their net reduction.
- Thus, **Article 6 of the Paris Agreement** introduces provisions for using international carbon markets to facilitate fulfillment of Nationally Determined Contributions (NDCs) by countries.
- **Article 6.2** provides an accounting framework for international cooperation, such as linking the emissions-trading schemes of two or more countries.
- **Article 6.4** establishes a central UN mechanism to trade credits from emissions reductions generated through specific projects. For example, country A could pay for country B to build a wind farm instead of a coal plant. Emissions are reduced, country B benefits from the clean energy and country A gets credit for the reductions.
- **Article 6.8** establishes a work program for non-market approaches, such as applying taxes to discourage emissions.



Q. Consider the following statements:



Statement I:

Studies indicate that carbon dioxide emissions from cement industry account for more than 5% of global carbon emissions.

Statement II:

Silica-bearing clay is mixed with limestone while manufacturing cement.

Statement III:

Limestone is converted into lime during clinker production for cement manufacturing.

Which one of the following is correct in respect of the above statements?

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- **Cement industry** is one of the major source of carbonisation of environment, where cement manufacturing accounts for **roughly 8% of the world's anthropogenic carbon dioxide emissions** and consumes 2-3% of global energy supply according to the International energy agency.
- **Formation of cement** - calcination or the clinker production method is carried to convert CaCO_3 in limestones into calcium oxide (CaO) or lime and releases CO_2 .
- **Silica based clay** is also mixed with limestone during cement production leads to release of CO_2 .



Q. Consider the following statements:

Statement I:

At the 28th United Nations Climate Change Conference (COP28), India refrained from signing the 'Declaration on Climate and Health'.

Statement II:

The COP28 Declaration on Climate and Health is a binding declaration; and if signed, it becomes mandatory to decarbonize health sector.

Statement III:

If India's health sector is decarbonized, the resilience of its health-care system may be compromised.

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- Statement I is correct as India refrained from signing the 'declaration on climate and health'.
- Statement II is incorrect as the declaration is non-binding and voluntary political declaration to gather support for action on climate change and health.
- Statement III is correct as India do not sign the declaration on climate and health due to its concerns about the practicality of reducing greenhouse gas emissions from cooling the country's healthcare infrastructure.



Q. Which organization has enacted the Nature Restoration Law (NRL) to tackle climate change and biodiversity loss?

- (a) The European Union
- (b) The World Bank
- (c) The Organization for Economic Cooperation and Development
- (d) The Food and Agriculture Organization



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- EU came up with the nature restoration law as a regulation to restore degraded ecosystems and tackle the triple crisis of **climate, change, biodiversity, loss, and environmental degradation** across EU land and sea areas.
- It was the first time that a continent wide **comprehensive law is adopted, whose primary aim is restoration**. It came into force on 18 August 2024.
- Under the law member states will have to restore **at least 20% of the EU land and sea by 2030** including terrestrial, coastal and freshwater, Forest agriculture, and urban areas.
- By 2050, the measure should extend to all ecosystems that require restoration.



**Q. Which one of the following
launched the 'Nature Solutions Finance
Hub for Asia and the Pacific'?**

- (a) The Asian Development Bank (ADB)
- (b) The Asian Infrastructure Investment Bank (AIIB)
- (c) The New Development Bank (NDB)
- (d) The International Bank for Reconstruction and Development (IBRD)



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Reconstruction and Development
(IBRD)

- The **Asian Development bank (ADB)** launched the **Nature solutions finance hub for Asia and the Pacific**.
- The ADB unveiled this hub at **COP28** with the goal of attracting significant investments in nature-based solutions projects across the Asia Pacific region.
- It aims to **mobilize funding** for projects that incorporate **nature-based solutions** to address climate change and biodiversity loss.
- The hub aims to attract **at least \$2 billion** in investments.



Q. Consider the following statements:

Statement-I:

The European Parliament approved The Net-Zero Industry Act recently.

Statement-II:

The European Union intends to achieve carbon neutrality by 2040 and therefore aims to develop all of its own clean technology by that time.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
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- The **Net-Zero Industry Act (NZIA)** was approved by the European Parliament in **2024**.
- The NZIA aims **to strengthen the EU's clean energy industry** and reduce dependency on imports, especially in the context of green technologies like solar panels, wind turbines, and batteries.
- The goal is to produce at least **40% of the EU's clean technology needs domestically by 2030** and become a global leader in clean tech manufacturing.
- The European Union's official target for achieving **carbon neutrality (net-zero emissions) is by 2050**, not 2040.



Q. Among the following crops, which one is the most important anthropogenic source of both methane and nitrous oxide?



- a) Cotton
- b) Rice
- c) Sugarcane
- d) Wheat



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Sleepy Classes
Awakening Toppers

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- Paddy fields are anthropogenic sources of **atmospheric nitrous oxide (N₂O)** and **methane (CH₄)**, which have been reckoned as 273 and 80-83 times more powerful than CO₂ in driving temperature increase in 20 years.
- Paddies are a **potential source of anthropogenic nitrous oxide (N₂O) emissions**.
- In paddies, both the soil and the rice plants emit N₂O into the atmosphere.
- The rice plant in the paddy is considered to act as a channel between the soil and the atmosphere for N₂O emission.



Q. With reference to 'Direct Air Capture', an emerging technology, which of the following statements is/are correct?

- I. It can be used as a way of carbon sequestration.
- II. It can be a valuable approach for plastic production and in food processing.
- III. In aviation, it can be a source of carbon for combining with hydrogen to create synthetic low-carbon fuel.

Select the correct answer using the code given below.

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- (c) I, II and III
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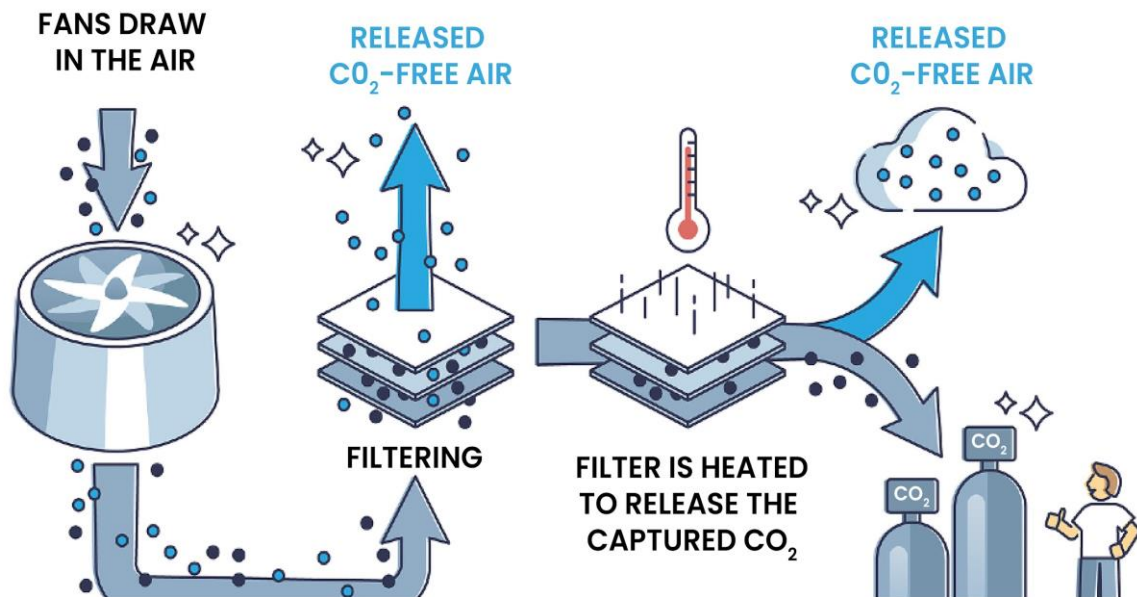
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- **Direct air capture** is a way of carbon sequestration which involves extracting carbon dioxide directly from the atmosphere using chemical or physical processes.
- It can be valuable approach for **plastic producing** and **food processing** as well as in **aviation sector** to create synthetic low carbon fuels.

DIRECT AIR CAPTURE



ALL INDIA PRELIMS MOCK TEST

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All India Rank



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GENERAL STUDIES

Q).In the context of mitigating the impending global warming due to anthropogenic emissions of carbon dioxide, which of the following can be potential sites for carbon sequestration?



1. Abandoned and uneconomic coal seams
2. Depleted oil and gas reservoirs
3. Subterranean deep saline formations

Select the correct answer using the code given below:

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



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- **Carbon sequestration** is the process of capturing and storing atmospheric carbon dioxide.
- It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change.
- **Geological sequestration** involves the storage of CO_2 underground in depleted oil and gas reservoirs, saline formations or deep, unminable coal beds.
- **Deep saline aquifers** are large underground formations of saltwater.
- CO_2 reacts with the minerals in saline water, forming stable carbonates (called **mineral trapping**).



Q. Consider the following activities:



1. Spreading finely ground basalt rock on farmlands
Extensively
2. Increasing the alkalinity of oceans by adding lime,
3. Capturing carbon dioxide released by various industries
and pumping it into abandoned subterranean mines in
the form of carbonated

How many of the above activities are often considered and discussed for carbon capture and sequestration?

- a) Only One
- b) Only Two
- c) All Three
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- Spreading finely ground basalt rock on farmlands Extensively
- This process is called **Enhanced Weathering**. Basalt is rich in calcium and magnesium, which react with atmospheric **carbon dioxide (CO₂)** to form **stable carbonates** that remain in the soil or wash into oceans, where they are stored.
- **Increasing the alkalinity of oceans by adding lime**, This is called **Ocean Alkalinity Enhancement**.
- Adding lime (CaO) increases the ocean's capacity to absorb atmospheric CO₂.
- Lime reacts with dissolved CO₂ to form **bicarbonates and carbonates**, locking CO₂ in the ocean and reducing acidification.
- **Capturing CO₂ from industries and storing it in subterranean mines**. This process is known as **Carbon Capture and Storage (CCS)**.
- Captured CO₂ is compressed and injected into geological formations like **abandoned oil and gas fields** or **deep saline aquifers**.
- Over time, the CO₂ reacts with minerals in the rock and forms stable carbonates.



Q).Which of the following statements best describes. "carbon fertilization"?

- a) Increased plant growth due to increased concentration of carbon dioxide in the atmosphere
- b) Increased temperature of Earth due to increased concentration of carbon dioxide in the atmosphere
- c) Increased acidity of oceans as a result of increased concentration of carbon dioxide in the atmosphere
- d) Adaptation of all living beings on Earth to the climate change brought about by the increased concentration of carbon dioxide in the atmosphere



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- As human-caused emissions add more carbon dioxide to the atmosphere, forests across the globe are using it to grow faster, reducing the amount that stays airborne.
- It is the phenomena that the increase of carbon dioxide in the atmosphere **increases the rate of photosynthesis in plants.**
- Tropical forests absorb 1.4 billion metric tonnes of carbon dioxide out of a total global absorption of 2.5 billion - more than what is absorbed by forests in Canada, Siberia and other northern regions, called boreal forests.
- Plants actually benefit from an oversupply because high CO₂ concentrations mean they must open their pores only briefly to absorb the gas.
- This way they lose less water and can better survive droughts.



Q. The scientific view is that the increase in global temperature should not exceed 2 °C above pre-industrial level. If the global temperature increases beyond 3°C above the pre-industrial level, what can be its possible impact/impacts on the world?

1. Terrestrial biosphere tends toward a net carbon source
2. Widespread coral mortality will occur.
3. All the global wetlands will permanently disappear.
4. Cultivation of cereals will not be possible anywhere in the world.

Select the correct answer using the code given below.

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- c) 2, 3 and 4 only
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- If global temperatures increase beyond 3°C above pre-industrial levels, the balance will shift due to the following reasons:
- **Increased respiration rates** – Higher temperatures accelerate plant and microbial respiration, leading to more CO_2 release.
- **Forest degradation and dieback** – Increased heat stress, droughts, and wildfires will reduce forest cover, turning forests into carbon sources.
- **Soil carbon loss** – Warmer soils increase microbial activity, causing soils to release more stored carbon.
- **Permafrost melting** – Thawing of permafrost will release massive amounts of CO_2 and methane (CH_4) into the atmosphere.
- **Reduced photosynthetic capacity** – Extreme heat and water stress will reduce the ability of plants to absorb CO_2 through photosynthesis.



Q. Human activities in the recent past have caused the increased concentration of carbon dioxide in the atmosphere, but a lot of it does not remain in the lower atmosphere because of



1. Its escape into the outer stratosphere.
2. The photosynthesis by phytoplankton in the oceans.
3. The trapping of air in the polar ice caps.

Which of the statements given above is/are correct?

- a) 1 and 2
- b) 2 only
- c) 2 and 3
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Q. The increasing amount of carbon dioxide in the air is slowly raising the temperature of the atmosphere, because it absorbs



- a) The water vapour of the air and retains its heat.
- b) The ultraviolet part of the solar radiation.
- c) All the solar radiations.
- d) The infrared part of the solar radiation.

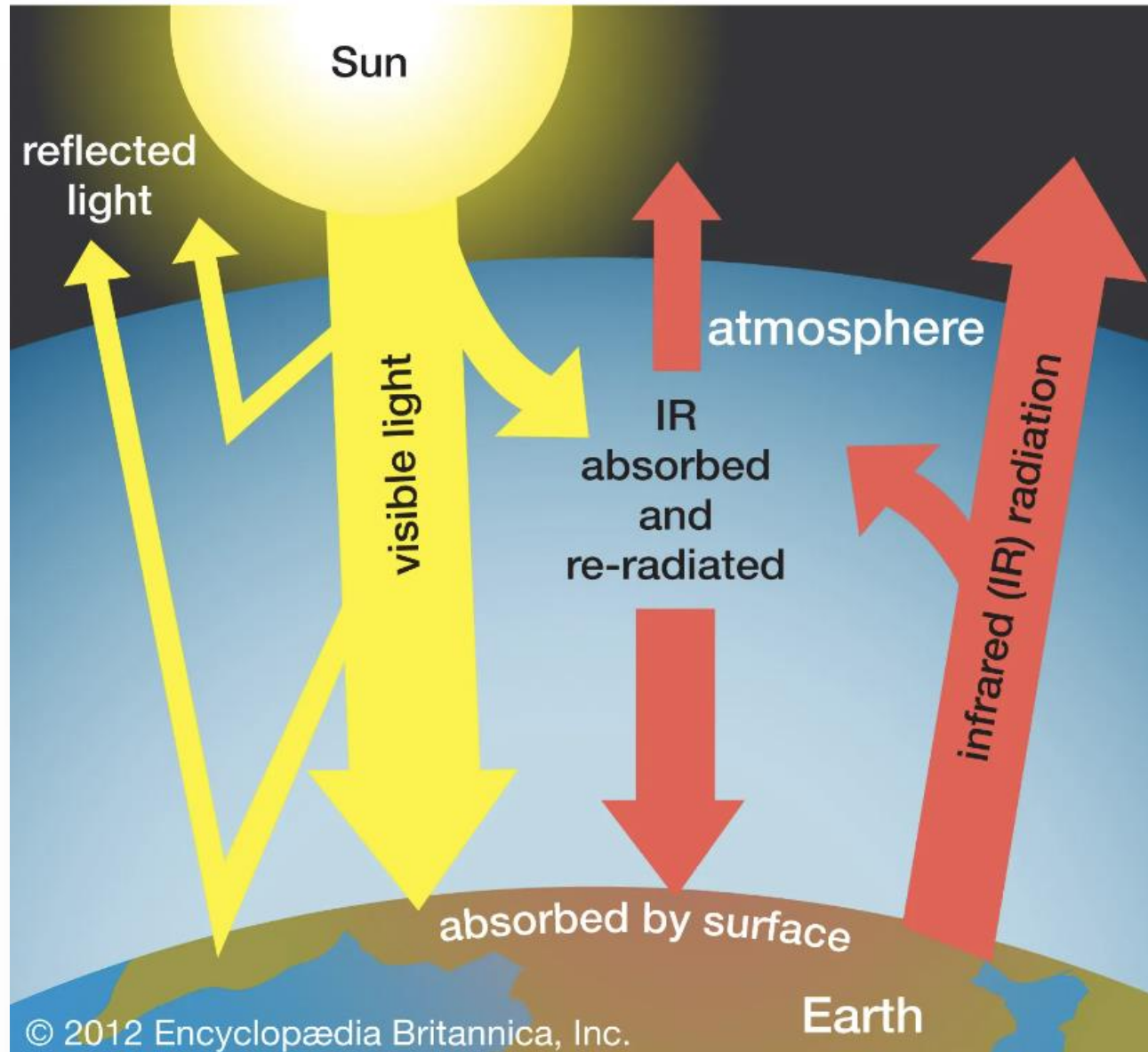


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Q. Consider the following statements:

- I. Carbon dioxide (CO_2) emissions in India are less than 0.5 t CO_2 /capita.
- II. In terms of CO_2 emissions from fuel combustion, India ranks second in Asia-Pacific region.
- III. Electricity and heat producers are the largest sources of CO_2 emissions in India.

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- (b) II only
- (c) II and III only
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- In 2022, India's per capita emissions were 1.89 t CO₂ per person. Per capita carbon dioxide (CO₂) emissions in India have soared in recent decades, climbing from 0.4 metric tons per person in 1970 to a high of 2.07 metric tons per person in 2023. Thus statement I is incorrect.
- India ranks second in the Asia-Pacific region in terms of CO₂ emissions from fuel combustion. **China ranks first in the region**, and India is second with 2,516.967 Mt CO₂ emissions, according to data from the International Energy Agency (IEA). Thus statement II is correct.
- In India, **electricity and heat production are the largest source** of CO₂ emissions. Specifically, the power sector, which is heavily reliant on coal, contributes significantly to the nation's overall CO₂ emissions. Thus statement III is correct



Q. Consider the following statements:

Statement-I: The atmosphere is heated more by incoming solar radiation than by terrestrial radiation.

Statement-II: Carbon dioxide and other greenhouse gases in the atmosphere are good absorbers of long wave radiation.

Which one of the following is correct in respect of the above statements?

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Q. What would happen if phytoplankton of an ocean is completely destroyed for some reason?



1. The ocean as a carbon sink would be adversely affected.
2. The food chains in the ocean would be adversely affected.
3. The density of ocean water would drastically decrease.

Select the correct answer using the codes given below:

- a) 1 and 2 only
- b) 2 only
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Q.) What is the Rio+20 Conference, often mentioned in the news?



- a) It is the United Nations Conference on Sustainable Development.
- b) It is a Ministerial Meeting of the World Trade Organization.
- c) It is a Conference of the Inter Government Panel on Climate Change.
- d) It is a Conference of the Member Countries of the Convention on Biological Diversity.



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- The **United Nations Conference on Sustainable Development - or Rio+20** - took place in Rio de Janeiro, Brazil on 20-22 June 2012.
- It resulted in a focused political outcome document which contains clear and practical measures for implementing sustainable development.
- In Rio, Member States decided to launch a process to develop a set of Sustainable Development Goals (SDGs), which will build upon the Millennium Development Goals and converge with the post 2015 development agenda.
- Since there is twenty years of gap (2012-1992) between the two summits, the latest RIO Summit is nicknamed “RIO +20”.



Q.) Which of the following statements regarding 'Green Climate Fund' is/are correct?



1. It is intended to assist the developing countries in adaptation and mitigation practices to counter climate change.
2. It is founded under the aegis of UNEP, OECD, Asian Development Bank and World Bank.

Select the correct answer using the codes given below:

- a) 1 only
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- The **Green Climate Fund** is a fund established within the framework of the UNFCCC as an operating entity of the Financial Mechanism to assist developing countries in adaptation and mitigation practices to counter climate change.
- It was set up in **2010**.
- It is the world's largest climate fund, mandated to support developing countries raise and realize their Nationally Determined Contributions (NDC) ambitions towards low-emissions, climate-resilient pathways.
- The GCF is based in **Incheon, South Korea**.



Q.) With reference to the Agreement at the UNFCCC Meeting in Paris in 2015, which of the following statements is/are correct?



1. The Agreement was signed by all the member countries of the UN and it will go into effect in 2017.
2. The Agreement aims to limit the greenhouse gas emissions so that the rise in average global temperature by the end of this century does not exceed 2°C or even 1.5°C above pre-industrial levels.
3. Developed countries acknowledged their historical responsibility in global warming and committed to donate \$ 1000 billion a year from 2020 to help developing countries to cope with climate change.



Select the correct answer using the code given below:

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



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b) 2 only

c) 2 and 3 only

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- The Paris Agreement is a **legally binding international treaty on climate change**.



- It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016.
- Its goal is to **limit global warming** to well below 2, **preferably to 1.5 degrees Celsius**, compared to pre-industrial levels.
- To achieve this long-term temperature goal, countries aim to **reach global peaking of greenhouse gas emissions as soon as possible** to achieve a climate neutral world by mid-century.
- Developed countries acknowledged their historical responsibility in global warming and committed to donate **\$ 100 billion a year** from 2020 to help developing countries to cope with climate change.



Q.) The term 'Intended Nationally Determined Contributions' is sometimes seen in the news in the context of



- a) pledges made by the European countries to rehabilitate refugees from the war-affected Middle East.
- b) plan of action outlined by the countries of the world to combat climate change.
- c) capital contributed by the member countries in the establishment of Asian Infrastructure Investment Bank.
- d) plan of action outlined by the countries of the world regarding Sustainable Development Goals.



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- Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals.
- NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.
- The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve.
- Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.



Q).Consider the following pairs:



Terms sometimes seen in the news : Their origin

1. Annex-I Countries : Cartagena Protocol
2. Certified Emissions Reductions : Nagoya Protocol
3. Clean Development Mechanisms : Kyoto Protocol

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

- a) 1 and 2 only
- b) 2 and 3 only
- c) 3 only
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Terms sometimes seen in the news : Their origin

1. Annex-I Countries : Cartagena Protocol
2. Certified Emissions Reductions : Nagoya Protocol
3. Clean Development Mechanisms : Kyoto Protocol

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

- a) 1 and 2 only
- b) 2 and 3 only
- c) 3 only**
- d) 1, 2 and 3



- The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997.
- Due to a complex ratification process, it entered into force on 16 February 2005.
- The detailed rules for the implementation of the Protocol were adopted at COP 7 in Marrakesh, Morocco, in 2001, and are referred to as the "Marrakesh Accords."
- Its first commitment period started in 2008 and ended in 2012.
- In short, the Kyoto Protocol is what "operationalizes" the Convention.
- It commits industrialized countries to stabilize greenhouse gas emissions based on the principles of the Convention.



- Under the Protocol, countries must meet their targets primarily through national measures.
- However, the Protocol also offers them an additional means to meet their targets by way of three market-based mechanisms.
- The Kyoto mechanisms are
 - International Emissions Trading
 - Clean Development Mechanism (CDM)
 - Joint implementation (JI)
- The mechanisms help to stimulate green investment and help Parties meet their emission targets in a cost-effective way.
- The CDM and JI are called "project-based mechanisms," in that they generate emission reductions from projects.
- The difference between IET and the project-based mechanisms is that IET is based on the setting of a quantitative restriction of emissions, while the CDM and JI are based on the idea of "production" of emission reductions.
- The CDM is designed to encourage production of emission reductions in non-Annex I Parties, while JI encourages production of emission reductions in Annex I Parties.



- Annex I parties are the industrialized (developed) countries and "economies in transition" (EITs).
- Annex II Parties are required to provide financial and technical support to the EITs and developing countries to assist them in reducing their greenhouse gas emissions (climate change mitigation) and manage the impacts of climate change (climate change adaptation).
- Annex B - Parties listed in Annex B of the Kyoto Protocol are Annex I Parties with first or second round Kyoto greenhouse gas emissions targets.
- Non-Annex I - Parties to the UNFCCC not listed in Annex I of the Convention are mostly low-income developing countries. Developing countries may volunteer to become Annex I countries when they are sufficiently developed.
- Least-developed countries (LDCs -49 Parties are LDCs, and are given special status under the treaty in view of their limited capacity to adapt to the effects of climate change.



Q.) With reference to the 'New York Declaration on Forests', which of the following statements are correct?



1. It was first endorsed at the United Nations Climate Summit in 2014.
2. It endorses a global timeline to end the loss of forests.
3. It is a legally binding international declaration.
4. It is endorsed by governments, big companies and indigenous communities.
5. India was one of the signatories at its inception.

Select the correct answer using the code given below:

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

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- The **New York Declaration on Forests (NYDF)** is a political declaration calling for global **action to protect and restore forests**.
- It offers a **common, multi-stakeholder framework** for forest action, consolidating various initiatives and objectives that drive forest protection, restoration, and sustainable use.
- Adopted in 2014 and refreshed in 2021, the NYDF is the major reference point for global forest action.
- Its ten goals include **halting natural forest loss by 2030**, restoring 350 million hectares of degraded landscapes and forestlands, improving governance, increasing forest finance, and reducing emissions from deforestation and forest degradation as part of the Paris Agreement.



- It is a **voluntary and non-legally binding political declaration** which grew out of dialogue among governments, companies and civil society, spurred by the United Nations Secretary-General's Climate Summit held in New York in 2014.
- The declaration includes ambitious targets **to end natural forest loss by 2030, with a 50% reduction by 2020** as a milestone toward its achievement.
- The Declaration is currently endorsed by over 190 entities including more than 50 governments, more than 50 of the world's biggest companies, and more than 50 influential civil society and indigenous organizations. It is not endorsed by India.



Q).Which of the following best describes/ describe the aim of 'Green India Mission' of the Government of India?



1. Incorporating environmental benefits and costs into the Union and State Budgets thereby implementing the 'green accounting'
2. Launching the second green revolution to enhance agricultural output so as to ensure food security to one and all in the future
3. Restoring and enhancing forest cover and responding to climate change by a combination of adaptation and mitigation measures

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- **Green India Mission** was launched in 2014.
- It is one of the eight missions launched under the **National Action Plan on Climate Change (NAPCC)**.
- The primary aim is to protect, restore and enhance India's diminishing forest cover.



Q.) What is 'Greenhouse Gas Protocol'?



- a) It is an international accounting tool for government and business leaders to understand, quantify and manage greenhouse gas emissions.
- b) It is an initiative of the United Nations to offer financial incentives to developing countries to reduce greenhouse gas emissions and to adopt ecofriendly technologies.
- c) It is an intergovernmental agreement ratified by all the member countries of the United Nations to reduce greenhouse gas emissions to specified levels by the year 2022.
- d) It is one of the multilateral REDD+ initiatives hosted by the World Bank.



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- The Paris Agreement commits countries to reduce greenhouse gas emissions to keep the global temperature rise below 1.5 degrees Celsius, in order to avoid the worst impacts of climate change.
- The GHG Protocol arose out of the need to help countries and companies account for, report, and mitigate emissions, based on a report that identified an action agenda to address climate change that included the need for standardized measurement of GHG emissions.



- The Greenhouse Gas Protocol (GHGP) provides accounting and reporting standards, sector guidance, calculation tools and trainings for businesses and local and national governments.
- It has created a comprehensive, global, standardized framework for measuring and managing emissions from private and public sector operations, value chains, products, cities and policies to enable greenhouse gas reductions across the board.
- The Greenhouse Gas (GHG) Protocol has been developed by **World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD)**.



Q).With reference to 'Global Climate Change Alliance', which of the following statements is/are correct?



1. It is an initiative of the European Union.
2. It provides technical and financial support to targeted developing countries to integrate climate change into their development policies and budgets.
3. It is coordinated by World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD).

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- The **Global Climate Change Alliance (GCCA)** is an initiative of the **European Union**.



- Its overall objective is to build a new alliance on climate change between the European Union and the poor developing countries that are most affected and that have the least capacity to deal with climate change.
- It helps mainly **Small Islands Developing States (SIDS) and Least Developed Countries (LDCs)** increase their resilience to climate change.

- It provides technical and financial support to targeted developing countries to integrate climate change into their development policies and budgets.
- The EU GCCA+ also supports these group of countries in implementing their commitments resulting from the 2015 Paris Agreement on Climate Change (COP21), in line with the 2030 Agenda for Sustainable Development and the new European Consensus on Development.



Q.)Consider the following statements:



1. Climate and Clean Air Coalition (CCAC) to Reduce Short Lived Climate Pollutants is a unique initiative of G20 group of countries.
2. The CCAC focuses on methane, black carbon and hydrofluorocarbons.

Which of the statements given above is/are correct?

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



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- The **Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC)** was launched by the **United Nations Environment Programme (UNEP)** and six countries — Bangladesh, Canada, Ghana, Mexico, Sweden, and the United States — on 16 February 2012.
- The program is managed out of the **United Nations Environmental Programme** through a Secretariat in Paris, France.
- The CCAC aims to catalyze rapid reductions in **short-lived climate pollutants** to protect human health, agriculture and the environment.
- The Coalition's initial focus is on methane, black carbon, and HFCs.



- The coalition has 53 country partners and 17 International Governmental Organizations and 45 Nongovernmental organization partners.
- **India is not a partner country** however The Energy and Resources Institute (TERI) is a partner NGO since 2015



Q).With reference to the 'Global Alliance for Climate-Smart Agriculture (GACSA)', which of the following statements is/are correct?

1. GACSA is an outcome of the Climate Summit held in Paris in 2015.
2. Membership of GACSA does not create any binding obligations.
3. India was instrumental in the creation of GACSA.

Select the correct answer using the code given below:

- a) 1 and 3 only
- b) 2 only
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- c) 2 and 3 only
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- The term **Climate-Smart Agriculture** was first coined by FAO in 2010 as a means to attract climate finance to its agricultural programme in Africa.
- GACSA is an **inclusive, voluntary and action-oriented multi-stakeholder platform** on Climate-Smart Agriculture (CSA). GACSA was launched in September 2014 in the margins of the UN Climate Summit.
- GACSA's vision is to improve food security, nutrition and resilience in the face of climate change.
- GACSA works towards **three aspirational outcomes** to:
 - Improve farmers' agricultural productivity and incomes in a sustainable way;
 - Build farmers' resilience to extreme weather and changing climate;
 - Reduce greenhouse gas emissions associated with agriculture, when possible.



- The GACSA alliance is made up of a diverse set of members that includes governments, NGOs, intergovernmental organizations (including UN and the African Union Commission), research/extension/education organizations, farmer organizations, financing institutions and the private sector.
- Key donor organizations engaging with GACSA include the governments of Canada, France, Japan, Netherlands, Norway, Switzerland, the United Kingdom and the United States of America.
- **India is just a signatory to GACSA** but was not instrumental in its creation.



Q)."Momentum for Change : Climate Neutral Now" is an initiative launched by



- a) The Intergovernmental Panel on Climate Change
- b) The UNEP Secretariat
- c) The UNFCCC Secretariat
- d) The World Meteorological Organization



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- The Paris Climate Change Agreement's central aim is to strengthen the global response to climate change by keeping a global temperature rise well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.
- To do so effectively requires that we achieve a climate neutral world by the second half of this century.
- The UNFCCC secretariat launched its Climate Neutral Now initiative in 2015.
- The following year, the secretariat launched a new pillar under its UN Global Climate Action Awards focused on **Climate Neutral Now**, as part of larger efforts to showcase successful climate action around the world.



Q.) In the context of which of the following do some scientists suggest the use of cirrus cloud thinning technique and the injection of sulphate aerosol into stratosphere?



- a) Creating the artificial rains in some regions.
- b) Reducing the frequency and intensity of tropical cyclones.
- c) Reducing the adverse effects of solar wind on the Earth.
- d) Reducing the global warming.



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- The geo-engineering technique known as stratospheric aerosol injection (SAI) could limit rising temperatures that are causing climate change.
- This would introduce aerosols into the stratosphere to create a cooling effect via global dimming, which occurs naturally from volcanic eruptions.
- It appears that stratospheric aerosol injection, at a moderate intensity, could counter most changes to temperature and precipitation, take effect rapidly, have low direct implementation costs, and be reversible in its direct climatic effects.



- Cloud thinning strategy would be used to shoot powder over cirrus clouds, which would thin out their coverage and alter their radiative effects over Earth.
- Thinning the clouds, according to some researchers could allow more heat to escape into space.



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Q. Consider the following statements:



1. High clouds primarily reflect solar radiation and cool the surface of the Earth.
2. Low clouds have a high absorption of infrared radiation emanating from the Earth's surface and thus cause warming effect.

Which of the statements given above is/are correct?

- A. 1 only
- B. 2 only
- C. Both 1 and 2
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Q.) Which of the following statements are correct about the deposits of 'methane hydrate'?



1. Global warming might trigger the release of methane gas from these deposits.
2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the seafloor.
3. Methane in atmosphere oxidizes to carbon dioxide after decade or two.

Select the correct answer using the code given below:

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- b) 2 and 3 only
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- **Methane hydrate** is formed when hydrogen-bonded water and methane gas come into contact at high pressures and low temperatures in oceans.
- Methane hydrate is a crystalline solid that consists of a methane molecule surrounded by a cage of interlocking water molecules.
- Owing to melting of ice, global warming might trigger the release of methane gas from these deposits.
- Four Earth environments have the temperature and pressure conditions suitable for the formation and stability of methane hydrate. These are:
 - sediment and sedimentary rock units below Arctic permafrost;
 - sedimentary deposits along continental margins;
 - deep -water sediments of inland lakes and seas; and,
 - under Antarctic ice.



- Methane is relatively short - lived in the atmosphere; a molecule of methane is oxidized to water and carbon dioxide after a decade or so, mainly by reaction with another trace gas, the hydroxyl radical $\text{OH} \cdot$.
- Thus, unlike the case of carbon dioxide (which stays in the atmosphere longer than methane), a concerted effort to reduce methane emissions would have almost immediate results in terms of reduction of greenhouse effect.

Q.) Which one of the following statements best describes the term 'Social Cost of Carbon'? It is a measure, in monetary value, of the



- a) long-term damage done by a tonne of CO₂ emissions in a given year.
- b) requirement of fossil fuels for a country to provide goods and services to its citizens, based on the burning of those fuels.
- c) efforts put in by a climate refugee to adapt to live in a new place.
- d) contribution of an individual person to the carbon footprint on the planet Earth.



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- The social cost of carbon (SCC) is an estimate, in dollars, of the economic damages that would result from emitting one additional ton of greenhouse gases into the atmosphere.
- The SCC puts the effects of climate change into economic terms to help policymakers and other decision makers understand the economic impacts of decisions that would increase or decrease emissions.
- A higher SCC generally means that the benefits of a particular climate policy to cut CO₂ justify its cost; a low SCC makes a policy seemingly cost more than the benefits it ultimately delivers.
- Theoretically, the SCC should increase over time because physical and economic systems will become more stressed as the impacts of climate change accumulate.



Q.) The 'Common Carbon Metric', supported by UNEP, has been developed for



- a) assessing the carbon footprint of building operations around the world
- b) enabling commercial farming entities around the world to enter carbon emission trading
- c) enabling governments to assess the overall carbon footprint caused by their countries
- d) assessing the overall carbon foot-print caused by the use of fossil fuels by the world in a unit time



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- Leading experts from around the world have, through extensive international cooperation, developed a universal method of measuring a building's carbon footprint.
- Supported by the **United Nations Environment Programme**, this new 'Common Carbon Metric' will allow emissions from buildings around the world to be consistently assessed and compared, and improvements measured.



Q.) In the context of India's preparation for ClimateSmart Agriculture, consider the following statements:



1. The 'Climate-Smart Village' approach in India is a part of a project led by the Climate Change, Agriculture and Food Security (CCAFS), an international research programme.
2. The project of CCAFS is carried out under Consultative Group on International Agricultural Research (CGIAR) headquartered in France.
3. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India is one of the CGIAR's research centres.

Which of the statements given above are correct?

- a) 1 and 2 only
- b) 2 and 3 only
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- Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate.
- In Climate-Smart Villages, farmers and researchers test and implement portfolios of climate smart agricultural practices, technologies, and services, which can be combined together to make the best out of an increasingly difficult situation.
- Climate Change, Agriculture and Food Security (CCAFS) is an international programme to address the increasing challenge of global warming and declining food security on agricultural practices, policies and measures through a strategic collaboration between CGIAR and Future Earth.

-



- CGIAR is a global partnership that unites international organizations engaged in research about food security headquartered in France.
- CCAFS Climate -Smart Villages (CSVs) have successfully combined global knowledge with local action to help farmers sustainably produce more food, while curbing greenhouse gas emissions and increasing resilience to climate change. Hence, statement 1 is correct.
- ICRISAT, a CGIAR Research Center, is a non -profit, non -political public international research organization that conducts agricultural research for development in Asia and sub - Saharan Africa with a wide array of partners throughout the world.



Q. With reference to 'Global Environment Facility', which of the following statements is/are correct?

- a) It serves as financial mechanism for 'Convention on Biological Diversity' and 'United Nations Framework Convention on Climate Change'.
- b) It undertakes scientific research on environmental issues at global level.
- c) It is an agency under OECD to facilitate the transfer of technology and funds to underdeveloped countries with specific aim to protect their environment.
- d) Both (a) and (b)



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- The Global Environment Facility (GEF) was established 30 years ago on the eve of the **Rio Earth Summit** to tackle our **planet's most pressing environmental problems**.
- The GEF is the **largest multilateral trust fund** focused on **enabling developing countries** to invest in nature and supports the implementation of major international environmental conventions including on biodiversity, climate change, chemicals, and desertification.
- It brings together **184 member governments** in addition to civil society, international organizations, and private sector partners.
- The financial contributions to the GEF are **replenished every four years**.
- The Fund is currently in its **8th replenishment cycle**, GEF-8
- Through its **Small Grants Programme**, the GEF has provided support to more than 25,000 civil society and community initiatives in 135 countries.



- An independently operating financial organization, the **GEF provides grants** for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, persistent organic pollutants (POPs), mercury, sustainable forest management, food security, and sustainable cities.
- The GEF also serves as a **financial mechanism** for the following conventions:
 - Convention on Biological Diversity (CBD)
 - United Nations Framework Convention on Climate Change (UNFCCC)
 - United Nations Convention to Combat Desertification (UNCCD)
 - Stockholm Convention on Persistent Organic Pollutants
 - Minamata Convention on Mercury
- The GEF, although not linked formally to the **Montreal Protocol on Substances that Deplete the Ozone Layer (MP)**, supports implementation of the Protocol in countries with economies in transition



Q. "Climate Action Tracker, which monitors the emission reduction pledges of different countries is a:



- a) Database created by coalition of research organisations
- b) Wing of "International Panel of Climate Change"
- c) Committee under "United Nations Framework Convention on Climate Change"
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- The **Climate Action Tracker** is an independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C."
- A collaboration of two organisations, **Climate Analytics and New Climate Institute**, the CAT has been providing this independent analysis to policymakers since 2009.
- CAT **quantifies and evaluates climate change mitigation targets**, policies and action. It also aggregates country action to the global level, determining likely temperature increases during the 21st century using the MAGICC climate model.
- CAT further develops sectoral analysis to illustrate required pathways for meeting the global temperature goals.
- CAT tracks **39 countries and the EU** covering around 85% of global emissions.



Q. Consider the following statements:



1. "The Climate Group" is an international non-profit organization that drives climate action by building large networks and runs them.
2. The International Energy Agency in partnership with the Climate Group launched a global initiative "EP100".
3. EP100 brings together leading companies committed to driving innovation in energy efficiency and increasing competitiveness while delivering on emission reduction goals.
4. Some Indian companies are members of EP100.
5. The International Energy Agency is the Secretariat to the "Under2 Coalition".

Which of the statements given above are correct?

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



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Statement 1 is correct: The Climate Group is a non - profit organisation that works with business and government leaders around the world to address climate change. The group has programmes focusing on renewable energy and reducing greenhouse gas emissions.

Statement 2 is not correct and Statement 3 is correct: EP100 is a global initiative led by the international non - profit Climate Group, bringing together over 120 energy smart businesses committed to measuring and reporting on energy efficiency improvements. The Climate Group's global EP100 initiative, delivered in partnership with the Alliance to Save Energy, brings together leading companies improving their energy productivity; using less energy to achieve higher economic output.



Statement 4 is correct: Mahindra & Mahindra Ltd., the world's largest manufacturer of tractors, has signed up to EP100. The Indian-based company has committed to doubling their energy productivity by 2030, a core requirement for any business signing on to the campaign. Recently, Dalmia Cement and JSW Cement – two leading Indian cement companies - committed to the Climate Group's flagship business initiatives RE100, EV100 and EP100. Dalmia Cement committed to EV100, while they are already members of RE100 and EP100. JSW Cement, committed to all the three campaigns in one go.

Statement 5 is not correct: It is the largest global network of state and regional governments committed to reducing emissions in line with the Paris Agreement.



Q. Consider the following statements:



Statement – I

Carbon markets are likely to be one of the most widespread tools in the fight against climate change.

Statement – II

Carbon markets transfer resources from the private sector to the state.

Which one of the following is correct in respect of the Above statements?

- a) Both Statement—I and Statement-II are correct and Statement-II is the correct explanation for Statement—I
- b) Both Statement—I and Statement—II are correct and Statement—II is not the correct explanation for Statement—I
- c) Statement—I is correct but Statement II is incorrect
- d) Statement—I is incorrect but Statement—II is correct



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- b) Both Statement—I and Statement—II are correct and Statement—II is not the correct explanation for Statement—I**
- c) Statement—I is correct but Statement II is incorrect
- d) Statement—I is incorrect but Statement—II is correct



Q. Regarding “carbon credits”, which one of the following statements is not correct?



- a) The carbon credit system was ratified in conjunction with the Kyoto Protocol
- b) Carbon credits are awarded to countries or groups that have reduced greenhouse gases below their emission quota
- c) The goal of the carbon credit system is to limit the increase of carbon dioxide emission
- d) Carbon credits are traded at a price fixed from time to time of the United Nation Environment Programme



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- **Carbon Credits**
- It is a **credit for greenhouse emissions reduced or removed** from the atmosphere by an emission reduction project.
- A **carbon market** turns emission reductions and removals into tradeable assets, thus creating incentives to reduce emissions or improve energy efficiency.
- Carbon trading **started formally** in 1997 under the United Nations **Kyoto Protocol** on climate change.



- The **Kyoto Protocol** provides for three mechanisms that enable countries, or operators in developed countries, to acquire greenhouse gas reduction credits:
 - Under **Joint Implementation (JI)**, a developed country with relatively high costs of domestic greenhouse reduction would set up a project in another developed country.
 - Under the **Clean Development Mechanism (CDM)**, a developed country can “sponsor” a greenhouse gas reduction project in a developing country where the cost of greenhouse gas reduction project activities is usually much lower, but the atmospheric effect is globally equivalent.
 - Under **International Emissions Trading (IET)**, countries can trade in the international carbon credit market to cover their shortfall in Assigned Amount Units (AAUs). Countries with surplus units can sell them to countries that are exceeding their emission targets under Annex B of the Kyoto Protocol.



Q.) Which one of the following is associated with the issue of control and phasing out of the use of ozone-depleting substances?

- a) Bretton Woods Conference
- b) Montreal Protocol
- c) Kyoto Protocol
- d) Nagoya Protocol



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- The **Montreal Protocol on Substances that Deplete the Ozone Layer** is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as ozone depleting substances (ODS).
- When released to the atmosphere, those chemicals damage the stratospheric ozone layer, Earth's protective shield that protects humans and the environment from harmful levels of ultraviolet radiation from the sun.
- Adopted on 15 September 1987, the Protocol is to date the only UN treaty ever that has been ratified every country on Earth - all 198 UN Member States.



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Q. Consider the following statements:

Chlorofluorocarbons, known as ozone-depleting substances, are used



1. In the production of plastic foams.
2. In the production of tubeless tyres.
3. In cleaning certain electronic components.
4. As pressurizing agents in aerosol cans.

Which of the statements given above is/are correct?

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



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Q. Consider the following:



1. Aerosols
2. Foam agents
3. Fire retardants
4. Lubricants

In the making of how many of the above are hydrofluorocarbons used?

- a) Only one
- b) Only two
- c) Only three
- d) All four

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POLLUTION



Q. Consider the following:

- I. Cigarette butts
- II. Eyeglass lenses
- III. Car tyres

How many of them contain plastic?

- (a) Only one
- (b) Only two
- (c) All the three
- (d) None



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- (d) None

- The tobacco product waste in the cigarette butts consist of various toxic chemicals like **cellulose acetate** which has minute amounts of microplastics.
- Many **eyeglass lenses** are made up of plastic.
- Plastics like **polycarbonate** is a common material in lenses.
- **Car tyres** consist a significant amount of microplastics and account for 28% of the microplastics that enters the environment globally.



Q. Consider the following statements:



Statement I:

Activated carbon is a good and an attractive tool to remove pollutants from effluent streams and to remediate contaminants from various industries.

Statement II:

Activated carbon exhibits a large surface area and a strong potential for adsorbing heavy metals.

Statement III:

Activated carbon can be easily synthesized from environmental wastes with high carbon content.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement II and Statement III are correct and both of them explain Statement I
- (b) Both Statement II and Statement III are correct but only one of them explains Statement I
- (c) Only one of the Statements II and III is correct and that explains Statement I



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- **Activated Carbon** is a popular method for waste water treatment and removing pollutants from water.
- Materials have been used as raw material for manufacturing of activated carbon, which is further used for water purification as it has good potential for absorbing heavy metals because of its **great surface area, microporous ability and chemical complexity of the external area.**
- Also, the third statement is true that it can be **easily synthesised from environmental waste**, which have high carbon content



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Q. Artificial way of causing rainfall to reduce air pollution makes use of



- (a) silver iodide and potassium iodide
- (b) silver nitrate and potassium iodide
- (c) silver iodide and potassium nitrate
- (d) silver nitrate and potassium chloride



Q. Artificial way of causing rainfall to reduce air pollution makes use of



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- (d) silver nitrate and potassium chloride



- **Silver iodide, potassium iodide and dry salt** are common agents which are sprinkled into clouds to increase the moisture level leading to rainfall in the area.
- This process is known as **cloud seeding**.
- Cloud seeding is the **weather modification** technique that enhances precipitation by disposing chemicals like silver, iodide, potassium iodide or dry ice into clouds which serves as a nucleus for water droplet formation and leads to rainfall.



Q.) Consider the following:

1. Carbon monoxide
2. Methane
3. Ozone
4. Sulphur dioxide

Which of the above are released into atmosphere due to the burning of crop/biomass residue?

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



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- **Crop residues / biomass burning** are cheap and easiest method to dispose the leftover crop residues (wheat, rice, sugarcane etc.) after harvesting, for land clearing and pest control.
- Burning of crop residues is a common approach to eliminate waste after harvesting all over the world.
- Burning of these residues emit gases like sulphur dioxide (SO_2), oxides of nitrogen (NO_x), carbon dioxide (CO_2), carbon monoxide (CO), black carbon (BC), organic carbon (OC), methane (CH_4), volatile organic compounds (VOC), non-methane hydrocarbons (NMHCs), ozone (O_3), and aerosols, etc which affect the global atmospheric chemistry and climate.



Q. Consider the following:

1. Pyroclastic debris
2. Ash and dust
3. Nitrogen compounds
4. Sulphur compounds

How many of the above are products of volcanic eruptions?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four

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- Pyroclastic debris includes **fragments of lava, ash, pumice, and volcanic bombs** that are ejected during an explosive volcanic eruption.
- These materials **travel at high speeds** and can cause significant destruction.
- **Volcanic ash and dust** consist of **fine rock particles and glass fragments** released during eruptions.
- Volcanic eruptions do not significantly release nitrogen compounds.
- While volcanoes emit gases like CO_2 , SO_2 , NO_x , and H_2O .
- Volcanic eruptions **emit large amounts of sulfur dioxide (SO_2)**, which can combine with water vapor to form sulfuric acid, leading to **acid rain**.
- These compounds also contribute to **global cooling** by forming aerosols that reflect sunlight.



Q. Acid rain is caused by the pollution of environment by

- a) carbon dioxide and nitrogen
- b) carbon monoxide and carbon dioxide
- c) ozone and carbon dioxide
- d) nitrous oxide and sulphur dioxide



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Excess of which of the above in the environment is/are cause(s) of acid rain?

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- Acid rain results when **sulfur dioxide (SO₂)** and **nitrogen oxides (NO_x)** are emitted into the atmosphere and transported by wind and air currents.
- The SO₂ and NO_x react with water, oxygen and other chemicals to form sulfuric and nitric acids.
- These then mix with water and other materials before falling to the ground.



Q. Consider the following:

1. Carbon dioxide
2. Oxides of Nitrogen
3. Oxides of Sulphur

Which of the above is/are the emission/emissions from coal combustion at thermal power plants?

- a) 1 only
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- Coal-based Thermal Power Plants (TPPs) are responsible for a disproportionately higher share of emissions than the industrial sector (60 per cent of PM, 45 per cent of SO₂, 30 per cent of NO₂ and 80 per cent of mercury (Hg)) .
- The emissions include a myriad of toxic air pollutants and carbon dioxide (CO₂), which is the most important human-produced climate-altering greenhouse gas.
- The CPCB has categorized TPP as highly polluting activities.



Q. According to the Environmental Protection Agency (EPA), which one of the following is the largest source of sulphur dioxide emissions?



- (a) Locomotives using fossil fuels
- (b) Ships using fossil fuels
- (c) Extraction of metals from ores
- (d) Power plants using fossil fuels



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- Burning coal releases high amounts of **sulfur dioxide** into the atmosphere.
- **Power plants, steel manufacturing, and cement production** are major contributors.
- The **burning of fossil fuels (especially coal in power plants)** is the **largest source** of sulphur dioxide emissions globally.
- According to NASA & UNEP, **India, China, and Russia** are among the top emitters of SO_2 due to heavy reliance on coal-based power.



Q.) Consider the following statements:



1. Coal ash contains arsenic, lead and mercury.
2. Coal-fired power plants release sulphur dioxide and oxides of nitrogen into the environment.
3. High ash content is observed in Indian coal.

Which of the statements given above is/are correct?

- a) 1 only
- b) 2 and 3 only
- c) 3 only
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- Coal ash is the waste that is left after coal is combusted (burned).
- It includes **fly ash** (fine powdery particles that are carried up the smoke stack and captured by pollution control devices) as well as **coarser materials** that fall to the bottom of the furnace.
- Coal itself isn't a particularly toxic material.
- But after it's burned, what remains in the ash includes **lead, mercury, cadmium, chromium, arsenic, and selenium**, all in levels that may threaten human health.
- Thermal power plants produce large amounts of nitrogen oxides and sulfur dioxide—the pollutants that cause acid rain—when they burn fossil fuels, especially coal, to produce energy.
- India's domestic coal reserves have a high ash content—up to **40 to 45 percent**.



Q. With reference to coal-based thermal power plants in India, consider the following statements:



1. None of them uses seawater
2. None of them is set up in water-stressed district.
3. None of them is privately owned

How many of the above statements are correct?

- a) Only one
- b) Only two
- c) All three
- d) None



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Q. Consider the following statements regarding mercury pollution:



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1. Gold mining activity is a source of mercury pollution in the world.
2. Coal-based thermal power-plants cause mercury pollution.
3. There is no known safe level of exposure to mercury

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- Mercury is widely used in **artisanal and small-scale gold mining (ASGM)** to extract gold from ore.



- During this process, **mercury binds with gold** to form an amalgam, which is later heated, releasing **toxic mercury vapors**.
- Mercury is a **highly toxic heavy metal** with no safe level of exposure.
- Even **low concentrations** can cause **neurological damage, developmental disorders, and kidney damage**.



Q).In the context of solving pollution problems, what is/are the advantage/advantages of bioremediation technique?



1. It is a technique for cleaning up pollution by enhancing the same biodegradation process that occurs in nature.
2. Any contaminant with heavy metals such as cadmium and lead can be readily and completely treated by bioremediation using microorganisms.
3. Genetic engineering can be used to create microorganisms specifically designed for bioremediation.

Select the correct answer using the code given below:

- (a) 1 only
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- (c) 1 and 3 only
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- Bioremediation is treatment that uses **naturally occurring organisms** to break down hazardous substances **into less toxic or non-toxic substances**.
- It uses microorganisms to degrade organic contaminants in soil, groundwater, sludge, and solids.
- The microorganisms break down contaminants by using them as an **energy source**.
- But **not all contaminants** are easily treated by bioremediation using microorganisms.
- For example, **heavy metals such as cadmium and lead are not readily absorbed or captured** by microorganisms.



- Genetic engineering has been used to create organisms designed for specific purposes.
- Genetically engineered microorganisms (GEMs) have **shown potential for bioremediation of soil, groundwater and activated sludge**, exhibiting the enhanced degrading capabilities of a wide range of chemical contaminants
- e.g. bacterium, *Deinococcus radiodurans* (the most radioresistant organism known) has been modified to consume and **digest toluene and ionic mercury** from highly radioactive nuclear waste

Q. "Membrane Bioreactors" are often discussed in the context of:



- (a) Assisted reproductive technologies
- (b) Drug delivery nanotechnologies
- (c) Vaccine production technologies
- (d) Wastewater treatment technologies



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EX SITU BIOREMEDIATION



Bioreactors

- It involves the processing of contaminated solid material (soil, sediment, sludge) or water through an engineered containment system.

Composting

- Composting is nature's process of recycling decomposed organic materials into a rich soil known as compost.

- Membrane Bioreactors (MBRs) are **advanced wastewater treatment technologies** that combine biological treatment processes with membrane filtration.
- They are widely used for **water purification and wastewater treatment.**

Q.) In the cities of our country, which among the following atmospheric gases are normally considered in calculating the value of Air Quality Index?



1. Carbon dioxide
2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide
5. Methane

Select the correct answer using the code given below:

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

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- b) 2, 3 and 4 only**
- c) 1, 4 and 5 only
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- Launched by the **Environment Ministry** in April 2015.
- Initiative under '**Swachh Bharat**'.
- It helps the common man to judge the air quality within his vicinity.
- There are **six AQI categories**, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe.
- Pollutants considered - It considers eight pollutants (**PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb**).



- The government is executing a nation-wide programme of ambient air quality monitoring known as **NAMP**.



- Under NAMP, four air pollutants viz. **SO₂, NO₂, suspended particulate matter (PM₁₀), and fine particulate matter (PM_{2.5})** have been identified for regular monitoring at all the locations.
- In addition, there are 134 real-time **Continuous Ambient Air Quality Monitoring stations (CAAQMS)** in 71 cities across 17 states, monitoring 08 pollutants viz.
- **PM₁₀, PM_{2.5}, SO₂, NO_x, ammonia (NH₃), CO, ozone (O₃), and benzene.**



Revised National Ambient Air Quality Standards (NAAQS)

[NAAQS Notification dated 18th November, 2009]



S. No.	Pollutants	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (notified by Central Government)	
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual*	50	20	1. Improved West and Gaeke 2. Ultraviolet Fluorescence
		24 Hours**	80	80	
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual*	40	30	1. Modified Jacob & Hochheiser 2. Chemiluminescence
		24 Hours**	80	80	
3	Particulate Matter (Size <10µm) or PM ₁₀ µg/m ³	Annual*	60	60	1. Gravimetric 2. TEOM 3. Beta attenuation
		24 Hours**	100	100	
4	Particulate Matter (Size <2.5 µm) or PM _{2.5} µg/m ³	Annual*	40	40	1. Gravimetric 2. TEOM 3. Beta attenuation
		24 Hours **	60	60	
5	Ozone (O ₃), µg/m ³	8 hours**	100	100	1. UV photometric 2. Chemiluminescence 3. Chemical Method
		1 hours **	180	180	
6	Lead (Pb), µg/m ³	Annual *	0.50	0.50	1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper 2. ED-XRF using Teflon filter
		24 Hour**	1.0	1.0	
7	Carbon Monoxide (CO), mg/m ³	8 Hours **	02	02	Non dispersive Infra Red (NDIR) Spectroscopy
		1 Hour**	04	04	
8	Ammonia (NH ₃), µg/m ³	Annual*	100	100	1. Chemiluminescence 2. Indophenol blue method
		24 Hour**	400	400	
9	Benzene (C ₆ H ₆), µg/m ³	Annual *	05	05	1. Gas chromatography based continuous analyzer 2. Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP)-particulate phase only, ng/m ³	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m ³	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m ³	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform



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Q. Photochemical smog is a resultant of the reaction among



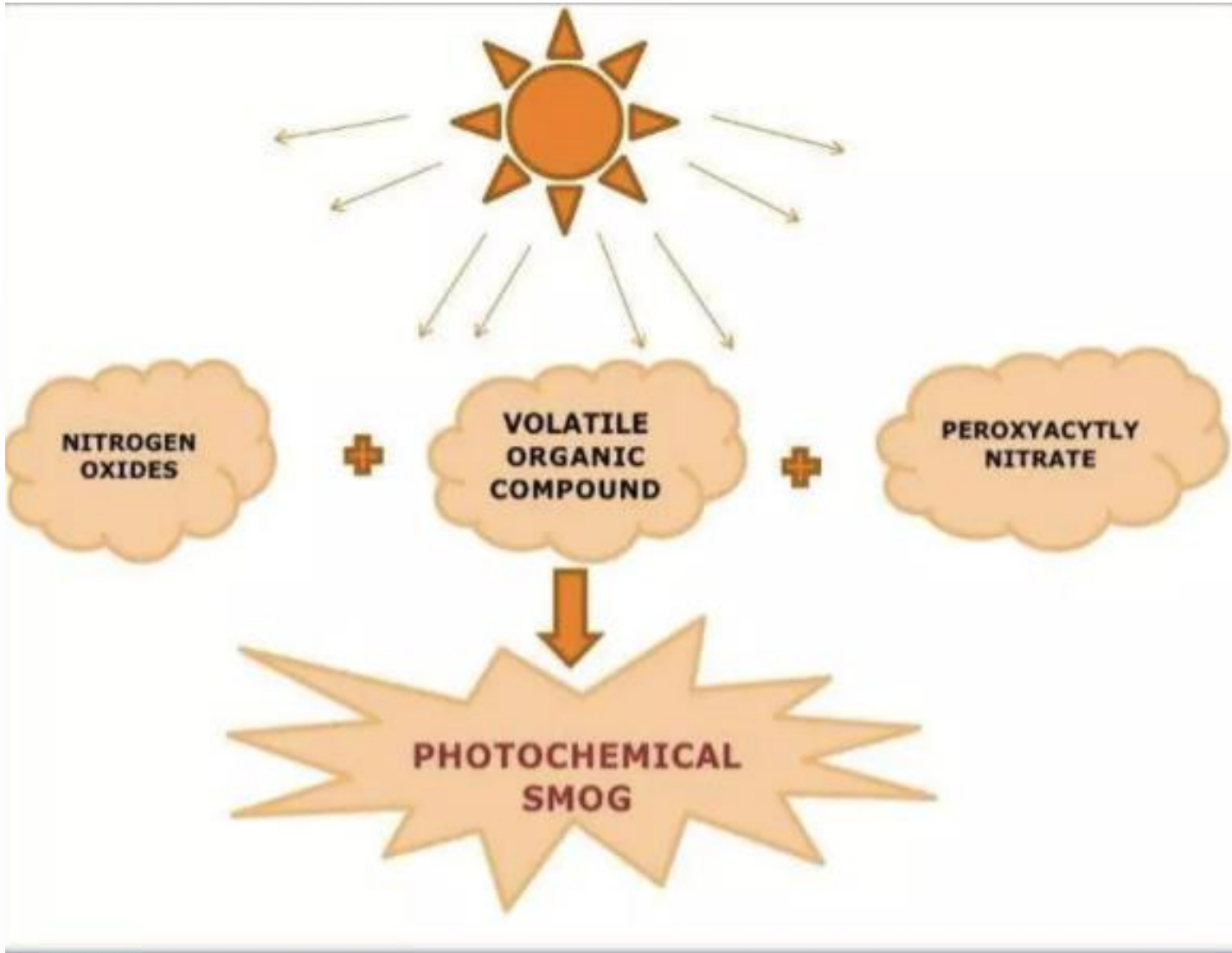
- a) NO_2 , O_3 and peroxyacetyl nitrate in the presence of sunlight
- b) CO , O_2 and peroxyacetyl nitrate in the presence of sunlight
- c) CO , CO_2 and NO_2 at low temperature
- d) high concentration of NO_2 , O_3 and CO in the evening



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Q. Which of the following are some important pollutants released by steel industry in India ?



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1. Oxides of sulphur
2. Oxide of nitrogen
3. Carbon monoxide
4. Carbon dioxide

Select the correct answer using the code given below

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



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Q. In the Union Budget 2011-12, a full exemption from the basic customs duty was extended to the bio-based asphalt (bioasphalt). What is the importance of this material?



1. Unlike traditional asphalt, bio-asphalt is not based on fossil fuels.
2. Bioasphalt can be made from non-renewable resources.
3. Bioasphalt can be made from organic waste materials.
4. It is eco-friendly to use biosphalt for surfacing of the roads.

Which of the statements given above are correct?

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- **Traditional asphalt** is derived from **petroleum-based bitumen**, making it reliant on fossil fuels.
- **Bio-asphalt**, on the other hand, is made from **biomass-derived materials** such as vegetable oils, lignin, algae, and other organic compounds.
- Bio-asphalt is biodegradable, reduces dependency on fossil fuels, and **enhances sustainability**.
- Bio-asphalt roads have **comparable durability** to conventional roads while being environmentally friendly.





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Q. In the context of WHO Air Quality Guidelines, consider the following statements:

1. The 24-hour mean of PM_{2.5} should not exceed 15 $\mu\text{g}/\text{m}^3$ and annual mean of PM_{2.5} should not exceed 5 $\mu\text{g}/\text{m}^3$.
2. In a year, the highest levels of ozone pollution occur during the periods of inclement weather.
3. PM₁₀ can penetrate the lung barrier and enter the bloodstream.
4. Excessive ozone in the air can trigger L asthma.

Which of the statements given above are correct?

- A. 1, 3 and 4
- B. 1 and 4 only
- C. 2, 3 and 4
- D. 1 and 2 only



Q. In the context of WHO Air Quality Guidelines, consider the following statements:

1. The 24-hour mean of PM_{2.5} should not exceed 15 $\mu\text{g}/\text{m}^3$ and annual mean of PM_{2.5} should not exceed 5 $\mu\text{g}/\text{m}^3$.
2. In a year, the highest levels of ozone pollution occur during the periods of inclement weather.
3. PM₁₀ can penetrate the lung barrier and enter the bloodstream.
4. Excessive ozone in the air can trigger L asthma.

Which of the statements given above are correct?

- A. 1, 3 and 4
- B. 1 and 4 only**
- C. 2, 3 and 4
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Q. With reference to polyethylene terephthalate the use of which is so widespread in our da lives, consider the following statements:

1. Its fibres can be blended with wool and cotton fibres to reinforce their properties
2. Containers made of it can be used to store any alcoholic beverage.
3. Bottles made of it can be recycled into other products.
4. Articles made of it can be easily disposed of by incineration without causing greenhouse gas emissions.

Which of the statements given above are correct?

- A. 1 and 3
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Q).How is the National Green Tribunal (NGT) different from the Central Pollution Control Board (CPCB)?



1. The NGT has been established by an Act whereas the CPCB has been created by an executive order of the Government.
2. The NGT provides environmental justice and helps reduce the burden of litigation in the higher courts whereas the CPCB promotes cleanliness of streams and wells, and aims to improve the quality of air in the country.

Which of the statements given above is/are correct?

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- b) 2 only
- c) Both 1 and 2
- d) Neither 1 nor 2



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- The National Green Tribunal (NGT) is a statutory body that was established **in 2010 by the National Green Tribunal Act.**
- It was set up to handle cases and speed up the cases related to environmental issues.
- The Tribunal **shall not be bound** by the procedure laid down under the Code of Civil Procedure, 1908, but shall be **guided by principles of natural justice.**
- The Tribunal is mandated to make and endeavor for disposal of applications or appeals finally within 6 months of filing of the same.



- The **Central Pollution Control Board (CPCB)**, statutory organization, was constituted in September, 1974 under the **Water (Prevention and Control of Pollution) Act, 1974**.
- Further, CPCB was entrusted with the powers and functions under the **Air (Prevention and Control of Pollution) Act, 1981**.
- It serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986.
- Principal Functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981,)
 - To promote the cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution, and
 - To improve the quality of air and to prevent, control or abate air pollution in the country



Q. Lead, ingested or inhaled, is a health hazard. After the addition of lead to petrol has been banned, what still are the sources of lead poisoning?



1. Smelting units
2. Pens and pencils
3. Paints
4. Hair oils and cosmetics

Select the correct answer using the codes given below:

- a) 1, 2 and 3 only
- b) 1 and 3 only
- c) 2 and 4 only
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Organization	Limit for Lead in Drinking Water
World Health Organization (WHO)	0.01 mg/L (10 ppb)
Bureau of Indian Standards (BIS)	0.01 mg/L (10 ppb)
EPA (US)	0.015 mg/L (15 ppb) – action required if exceeded

Q. Which of the following can be found as pollutants in the drinking water in some parts of India?



1. Arsenic
2. Sorbitol
3. Fluoride
4. Formaldehyde
5. Uranium

Select the correct answer using the codes given below

- a) 1 and 3 only
- b) 2, 4 and 5 only
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ARSENIC POLLUTION

- Contamination of ground water by arsenic leads to **accumulation of arsenic in the body parts like blood, nails and hairs** causing skin lesions, rough skin, dry and thickening of skin and ultimately skin cancer. **(Black Foot Disease)**
- Arsenic is highly toxic in its organic form and presence of high levels of arsenic in groundwater renders it toxic.
- **Long-term exposure** to arsenic from drinking-water and food can cause **cancer and skin lesions**.
- It has also been associated with **developmental effects, cardiovascular disease, neurotoxicity and diabetes**.
- The government of India had kept the maximum arsenic level in water at 50 $\mu\text{g/L}$ while WHO has kept it at 10 $\mu\text{g/L}$.
- However, in India, the permissible limit in drinking water has recently been revised from .05 mg per litre to .01 mg per litre.



FLUOROSIS

- Ingestion of excess fluoride, most commonly in drinking-water, can cause **fluorosis** which affects the **teeth and bones**.
- Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems.
- Paradoxically, low levels of fluoride intake help to prevent dental caries.



URANIUM CONTAMINATION



- The **primary source of uranium** is geogenic i.e., main source of uranium is granite, which is common in the Himalayan range.
- Over the years, uranium may have **slowly leached into the water**.
- However, anthropogenic factors such as overexploitation of groundwater for agricultural irrigation and nitrate pollution due to overuse of nitrogenous fertilizers may have further enhanced uranium mobilization.



Q.) In India, 'extended producer responsibility' was introduced as an important feature in which of the following?



- a) The Bio -medical Waste (Management and Handling) Rules, 1998
- b) The Recycled Plastic (Manufacturing and Usage) Rules, 1999
- c) The e -Waste (Management and Handling) Rules, 2011
- d) The Food Safety and Standard Regulations, 2011



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- EPR is a policy approach under which **producers are given a significant responsibility – financial and/or physical – for the treatment or disposal of post-consumer products.**



Sleepy Classes
Awakening Toppers

- Assigning such responsibility could in principle provide incentives to prevent wastes at the source, promote product design for the environment and support the achievement of public recycling and materials management goals.



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Q.) As per the Solid Waste Management Rules, 2016 in India, which one of the following statements is correct?



- a) Waste generator has to segregate waste five categories.
- b) The Rules are applicable to notified urban local bodies, notified towns and all industrial townships only.
- c) The Rules provide for exact and elaborate criteria for the identification of sites for landfills and waste processing facilities.**
- d) It is mandatory the part of waste generator that the waste generated in one district cannot be moved to another district.



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- The **SWM Rules 2016** provide for detailed criteria for setting -up solid waste processing and treatment facility, solid waste management in hilly areas, for waste to energy process, for Sanitary Landfills, for site selection, development of facilities at the sanitary landfills, specifications for land filling operations and closure on completion of landfilling, pollution prevention, Closure and Rehabilitation of Old Dumps etc.



Q. There is some concern regarding the nanoparticles of some chemical elements that are used by the industry in the manufacture of various products. Why?

1. They can accumulate in the environment and contaminate water and soil.
2. They can enter the food chains.
3. They can trigger the production of free radicals.

Select the correct answer using the code given below

- a) 1 and 2 only
- b) 3 only
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- Many of the **nano particles** are very stable and hence have a tendency for accumulation.
- They can **easily enter food chains** because of their very small size and stay in it because of their stable nature.
- They have the ability **to generate free radicals** and cause oxidative stress in cells.



Q.) Why is there a great concern about the 'microbeads' that are released into environment?



- a) They are considered harmful to marine ecosystems.
- b) They are considered to cause skin cancer in children.
- c) They are small enough to be absorbed by crop plants in irrigated fields.
- d) They are often found to be used as food adulterants.



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- Microplastics are small plastic pieces of less than five millimeters in size.
- Microplastic includes microbeads which are solid plastic particles of less than one millimeter in their largest dimension and are used in cosmetics and personal care products, industrial scrubbers which are used for aggressive blast cleaning, microfibers used in textiles and virgin resin pellets used in plastic manufacturing processes.
- They are most frequently made of polyethylene but can be of other petrochemical plastics such as polypropylene and polystyrene.
- Microbeads are washed down the drain, can pass unfiltered through the sewage treatment plants and make their way into rivers and canals, resulting in plastic particle water pollution.
- A variety of wildlife, from small fish, amphibians and turtles to birds and larger mammals, mistake microbeads for their food source.
- This ingestion of plastics introduces the potential for toxicity not only to these animals but to other species higher in the food chain.



Q. Brominated flame retardants are used in many household products like mattresses and upholstery. Why is there some concern about their use?

1. They are highly resistant to degradation in the environment.
2. They are able to accumulate in humans and animals.

Select the correct answer using the code given below.

- a) 1 only
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Q.) Which of the following are the reasons/factors for exposure to benzene pollution?



1. Automobile exhaust
2. Tobacco smoke
3. Wood burning
4. Using varnished wooden furniture
5. Using products made of polyurethane

Select the correct answer using the code given below:

- a) 1, 2 and 3 only
- b) 2 and 4 only
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- Benzene is a chemical that is a **colorless or light yellow liquid at room temperature.**
- It has a sweet odor and is highly flammable.
- Benzene **evaporates** into the air very quickly. Its vapor is heavier than air and may sink into low-lying areas.
- Benzene dissolves only slightly in water and will float on top of water.
- Benzene is formed from both natural processes and human activities.
- Natural sources of benzene include volcanoes and forest fires.
- Benzene is also a **natural part of crude oil, gasoline, and cigarette smoke.**



- A major source of benzene exposure is **tobacco smoke**.



- Outdoor air contains low levels of benzene from tobacco smoke, gas stations, **motor vehicle exhaust**, and industrial emissions.
- **Automobile exhaust accounts for the largest source of benzene** in the general environment.
- Indoor air generally contains levels of benzene higher than those in outdoor air.
- The benzene in indoor air comes from products that contain benzene such **as glues, paints, furniture wax, and detergents**.



Q.) Why is there a concern about copper smelting plants?



1. They may release lethal quantities of carbon monoxide into environment.
2. The copper slag can cause the leaching of some heavy metals into environment.
3. They may release sulphur dioxide as a pollutant.

Select the correct answer using the code given below:

- a) 1 and 2 only
- b) 2 and 3 only**
- c) 1 and 3 only
- d) 1, 2 and 3



- **Copper smelting plants** separate elemental copper from copper concentrates through multiple sulphide oxidizing stages.
- Smelting is a **process of applying heat** to ore in order to extract a base metal.
- The copper concentrates are fed through the flash smelting furnace with oxygen -enriched air.
- In the furnace, the concentrates are instantly oxidized, after which they melt and separate by their own reaction heat into copper matte with a grade of 65% and slag consisting of iron oxide, silica, and other compounds.



- Extractive metallurgical and smelting processes can be **highly polluting activities**.
- Some facilities that carry out metal and smelting processes are known to emit high quantities of air pollutants such as hydrogen fluoride, sulfur dioxide, oxides of nitrogen, offensive and noxious smoke fumes, vapors, gases, and other toxins.
- Due to the application of pyro - metallurgical processes in copper smelters, significant air pollution occurs with suspended particles.
- These particles contain high concentrations of **Lead (Pb), Cadmium (Cd), Nickel (Ni) and Arsenic (As)**.
- The carbon (or carbon monoxide derived from it) **removes oxygen from the ore, leaving the elemental metal**.
- The carbon thus oxidizes in two stages, producing first carbon monoxide and then carbon dioxide.



Q.) Steel slag can be the material for which of the following?



1. Construction of base road
2. Improvement of agricultural soil
3. Production of cement

Select the correct answer using the code given below:

- a) 1 and 2 only
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- **Steel slag** is an **industrial byproduct** obtained from the steel manufacturing industry.
- It is produced during the separation of the molten steel from impurities in steel -making furnaces.
- One of the **ingredients of asphalt is steel slag**, a by -product of the steel and iron production processes.
- Asphalt roads are made of a mixture of aggregates, binders and fillers.
- The **aggregates are typically iron and/or steel slag**, sand, gravel or crushed rock, and they are bound together with asphalt itself, which is a bitumen.
- Steel slags can be used in several activities, such as construction and paving, and also in the **agricultural sector due to its ability to correct soil acidity**, as it contains some nutrients for the plants and also as **silicate fertilizer** that is capable of providing silicon to the plants.



- Steel slag can also replace granulated blast furnace slag up to **10% in the manufacture of Portland Slag Cement.**
- Steel slag has been used successfully **to treat acidic water** discharges from abandoned mines.



Q.) In rural road construction, the use of which of the following is preferred for ensuring environmental sustainability or to reduce carbon footprint?



1. Copper slag
2. Cold mix asphalt technology
3. Geotextiles
4. Hot mix asphalt technology
5. Portland cement

Select the correct answer using the code given below:

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

- The use of copper slag in cement and concrete provides potential environmental as well as economic benefits for all related industries, particularly in areas where a considerable amount of copper slag is produced.
- Cold asphalt mix is produced by mixing unheated mineral aggregate with either emulsified bitumen or foamed bitumen.
- Unlike hot mix asphalt (HMA), cold asphalt mix does not require any heating of aggregate which makes it economical and relatively pollution-free (no objectionable fumes or odours).

- Production of cold asphalt mix does not require high investment in equipment, which makes it economical.
- It is also suitable for use in remote areas.
- Cold asphalt mixes can be used both for initial construction (100% virgin mixes) and for recycling of asphalt pavements.
- **Hot mix asphalt technology is major CO₂ emitter.**
- Geotextiles are mostly used in road construction, especially to fill gaps between the roads to improve soil structure. Geotextile makes poor soil more beneficial for use and then easy to build in difficult places also. It helps to prevent the erosion of soil but allows the water to drain off.
- **Portland cement** that binds concrete together is **energy intensive and emits enormous amounts of carbon dioxide (CO₂)** as well as numerous other pollutants.



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Q.) With reference to furnace oil, consider the following statements:



1. It is a product of oil refineries.
2. Some industries use it to generate power.
3. Its use causes sulphur emissions into environment.

Which of the statements given above are correct?

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- Fuel oil (also known as heavy oil, marine fuel, bunker, furnace oil, or gasoil) is a fraction obtained from petroleum distillation.



- Diesel-based power plants may use Diesel, Furnace Oil, Heavy Fuel Oil (HFO), Low Sulfur Fuel Oil (LSFO) or Low Sulfur Heavy Stock (LSHS).
- The oxides of sulphur (SO_x ; $\text{SO}_2 + \text{SO}_3$) emissions are a direct result of the sulphur content of the fuel oil.
- During the combustion process this fuel-bound sulphur is rapidly oxidised to sulphur dioxide (SO_2).
- A small fraction of the SO_2 , some 3-5% may be further oxidised to sulphur trioxide (SO_3) within the combustion chamber and exhaust duct.



Q.) Magnetite particles, suspected to cause neurodegenerative problems, are generated as environmental pollutants from which of the following?



1. Brakes of motor vehicles
2. Engines of motor vehicles
3. Microwave stoves within homes
4. Power plants
5. Telephone lines

Select the correct answer using the code given below:

- a) 1, 2, 3 and 5 only
- b) 1, 2 and 4 only
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- Magnetite is a mineral and one of the **main iron ores**, with the chemical formula $\text{Fe}^{2+}\text{Fe}^{3+}_2\text{O}_4$.
- It is one of the oxides of iron, and is **ferrimagnetic**; it is attracted to a magnet and can be magnetized to become a permanent magnet itself.
- It is the **most magnetic** of all the naturally occurring minerals on Earth.
- Magnetite can have potentially large impacts on the brain due to its unique combination of redox activity, surface charge and strongly magnetic behaviour.
- **Airborne magnetite pollution particles** $< \sim 200 \text{ nm}$ in size can **access the brain** directly via the olfactory and/or trigeminal nerves, bypassing the blood -brain barrier.



- They are generated by a wide variety of processes, both natural and fabricated, including forest fires and wood - burning stoves, road traffic pollution, and many high - temperature industrial processes .
- In addition to occupational settings (including, for example, exposure to printer toner powders), higher concentrations of magnetite pollution nanoparticles may arise in the indoor environment from open fires or poorly-sealed stoves used for cooking and/or heating, and in the outdoor environment from vehicle (tailpipe and brake wear) and/or industrial PM sources.
- **Mechanical wear**
- **Combustion**

Q. Due to improper / indiscriminate disposal of old and used computers or their parts, which of the following are released into the environment as e-waste?

1. Beryllium
2. Cadmium
3. Chromium
4. Heptachlor
5. Mercury
6. Lead
7. Plutonium

Select the correct answer using the codes given below.

- a) 1, 3, 4, 6 and 7 only
- b) 1, 2, 3, 5 and 6 only
- c) 2, 4, 5 and 7 only
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Q. Consider the following statements:



Statement-I:

Many chewing gums found in the market are considered a source of environmental pollution.

Statement-II:

Many chewing gums contain plastic as gum base.

Which one of the following is correct in respect of the above statements?

- (a) Both Statement-I and Statement-II are correct and Statement-II explains Statement-I
- (b) Both Statement-I and Statement-II are correct, but Statement-II does not explain Statement-I
- (c) Statement-I is correct, but Statement-II is incorrect
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Q. With reference to perfluoroalkyl and polyfluoroalkyl substances (PFAS) that are used in making many consumer products, consider the following statements:



Sleepy Classes
Awakening Toppers

1. PFAS are found to be widespread in drinking water, food and food packaging materials.
2. PFAS are not easily degraded in the environment.
3. Persistent exposure to PFAS can lead to bioaccumulation in animal bodies.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
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- **PFAS (Perfluoroalkyl and Polyfluoroalkyl Substances)** are widely used in products such as:
 - Non-stick cookware
 - Water-repellent clothing
 - Food packaging
- PFAS are known as "**forever chemicals**" because of their high resistance to degradation.
- Their strong **carbon-fluorine bonds** make them extremely stable in the environment, persisting for decades.
- PFAS accumulate in human and animal tissues over time because they are not **metabolized or excreted easily**.



Q. There is a concern over the increase in harmful algal blooms in the seawaters of India. What could be the causative factors for this phenomenon?



1. Discharge of nutrients from the estuaries.
2. Run-off from the land during the monsoon.
3. Upwelling in the seas.

Select the correct answer from the codes given below:

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AGRICULTURE



Q. With reference to the role of biofilters in Recirculating Aquaculture System, consider the following statements

1. Biofilters provide waste treatment by removing uneaten fish feed.
2. Biofilters convert ammonia present in fish waste to nitrate
3. Biofilters increase phosphorus as nutrient for fish in water.

How many of the statements given above are correct?

- a) Only one
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- c) All three
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- d) None



- Recirculating aquaculture systems (RAS) are used in **home aquaria and for fish production** where **water exchange is limited** and the use of biofiltration is required to reduce ammonia toxicity
- All RAS relies on **biofiltration to convert ammonia** (NH_4^+ and NH_3) excreted by the **fish and organic matter** (including uneaten feed) **into nitrate**.
- Ammonia is a waste product of fish metabolism and high concentrations ($>.02 \text{ mg/L}$) are toxic to most finfish.
- Biofilters **do not increase phosphorus levels**.
- Phosphorus is usually managed through feed composition or water exchange.



Q. In India, cluster bean (Guar) is traditionally used as a vegetable or animal feed, but recently the cultivation of this has assumed significance. Which one of the following statements is correct in this context?

- a) The oil extracted from seeds is used in the manufacture of biodegradable plastics
- b) The gum made from its seeds is used in the extraction of shale gas
- c) The leaf extract of this plant has the properties of anti-histamines
- d) It is a source of high quality biodiesel



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- **Clusterbean** commonly known as **guar**, has come to be recognized as one of the most important **commercial crop of arid and semi-arid region** of Rajasthan, Gujarat, and Haryana.
- It is a **drought-hardy leguminous crop** because of its **deep tap rooting system** and has a high capacity to recover from water stress.
- Belongs to the **Fabaceae** family.
- Guar gum is used as a **thickening agent** in the fracking fluid.
- Over **80% of the global guar gum supply** comes from India, with the USA being the largest importer due to its demand in shale gas extraction.





Q. Salinization occurs when the irrigation water accumulated in the soil evaporates, leaving behind salts and minerals. What are the effects of salinization on irrigated land?



- a) It greatly increases the crop production
- b) It makes some soils impermeable
- c) It raises the water table
- d) It fills the air spaces in the soil with water



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- High salt concentration can cause **soil particles to bind tightly**, reducing the soil's permeability and **preventing proper water infiltration and drainage.**



Q. Biomass gasification is considered to be one of the sustainable solutions to the power crisis in India. In this context, which of the following statements is/are correct?



1. Coconut shells, groundnut shells and rice husk can be used in biomass gasification.
2. The combustible gases generated consist of hydrogen and carbon dioxide only.
3. The combustible gases generated from biomass gasification can be used for direct heat generation but not in internal combustion engines.

Select the correct answer using the codes given below:

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



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Biomass gasification is a process that converts organic material into **syngas** (a mixture of hydrogen, carbon monoxide) through **partial combustion**.



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Q.) In the context of which one of the following are the terms 'pyrolysis and plasma gasification' mentioned?



- a) Extraction of rare earth elements
- b) Natural gas extraction technologies
- c) Hydrogen fuel-based automobiles
- d) Waste-to-energy technologies



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- **Pyrolysis** is a common technique used to convert plastic waste into energy, in the form of solid, liquid and gaseous fuels.



- Pyrolysis is the thermal degradation of plastic waste at different temperatures (300–900°C), in the absence of oxygen, to produce liquid oil
- **Plasma Gasification:** Plasma gasification is an extreme thermal process using plasma which converts organic matter into a syngas (synthesis gas - a mixture of carbon monoxide (CO) and hydrogen (H₂) which is primarily made up of hydrogen and carbon monoxide.
- These technologies are sometimes known as **Advanced Thermal Technologies or Alternative Conversion Technologies.**



Q. With reference to the usefulness of the by- products of sugar industry, which of the following statements is/are correct?



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1. Bagasse can be used as biomass fuel for the generation of energy.
2. Molasses can be used as one of the feedstocks for the production of synthetic chemical fertilizers.
3. Molasses can be used for the production of ethanol.

Select the correct answer using the codes given below:

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- **Molasses** is a dark, sweet syrup produced during sugar refining, while **bagasse** is the fibrous material left after sugarcane juice is extracted.
- When burned by a sugar mill, bagasse, the fibrous material leftover after juice is extracted from sugarcane, usually produces enough electricity to power all of the mill's operations and then some.
- Molasses fertilizer is an **organic fertilizer**.
- **Sugarcane ethanol** is an alcohol-based fuel produced by the fermentation of sugarcane juice and molasses.
- Sugarcane ethanol has emerged as a leading renewable fuel for the transportation sector.



100 tonnes of sugarcane produces



**10-12 tonnes
sugar**

**30-34 tonnes
bagasse**

**4-4.5 tonnes
molasses**

**3-3.5 tonnes
press mud**

Q. What are the significances of a practical approach to sugarcane production known as 'Sustainable Sugarcane Initiative' ?



1. Seed cost is very low in this compared to the conventional method of cultivation.
2. Drip irrigation can be practiced very effectively in this.
3. There is no application of chemical/inorganic fertilizers at all in this.
4. The scope for intercropping is more in this compared to the conventional method of cultivation

Select the correct answer using the code given below

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- c) 2, 3 and 4 only
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- The **Sustainable Sugarcane Initiative (SSI)** is a method of sugarcane production that aims to **improve productivity while reducing environmental impact** by using less seed, water, and fertilizers, promoting practices like wider spacing and intercropping.
- In conventional sugarcane planting, 6 to 8 tons of seeds are required per hectare, whereas in **SSI, only about 1.5 to 2 tons are required.**
- This reduces the overall seed cost significantly.
- Drip irrigation is highly **compatible with SSI** because it allows for precise water delivery to the root zone.
- SSI promotes balanced use of **organic manure and chemical fertilizers.**



Q).The FAO accords the status of 'Globally Important Agricultural Heritage System (GIAHS)' to traditional agricultural systems. What is the overall goal of this initiative?



1. To provide modern technology, training in modern farming methods and financial support to local communities of identified GIAHS so as to greatly enhance their agricultural productivity.
2. To identify and safeguard eco-friendly traditional farm practices and their associated landscapes, agricultural biodiversity and knowledge systems of the local communities.
3. The provide Geographical Indication status to all the varieties of agricultural produce in such identified GIAHS.



Select the correct answer using the code given below

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



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Select the correct answer using the code given below

a) 1 and 3 only

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- GIAHS aims to protect traditional agricultural systems. It will not provide any modern technology and training.
- GIAHS aims to identify and safeguard eco-friendly traditional farm practices and their associated landscapes, agricultural biodiversity and knowledge systems of the local communities.
- There is no such provision to provide Geographical Indication status.



Q. Contour bunding is a method of soil conservation used in



- a) desert margins, liable to strong wind action
- b) low flat plains, close to stream courses, liable to flooding
- c) scrublands, liable to spread of weed growth
- d) None of the above



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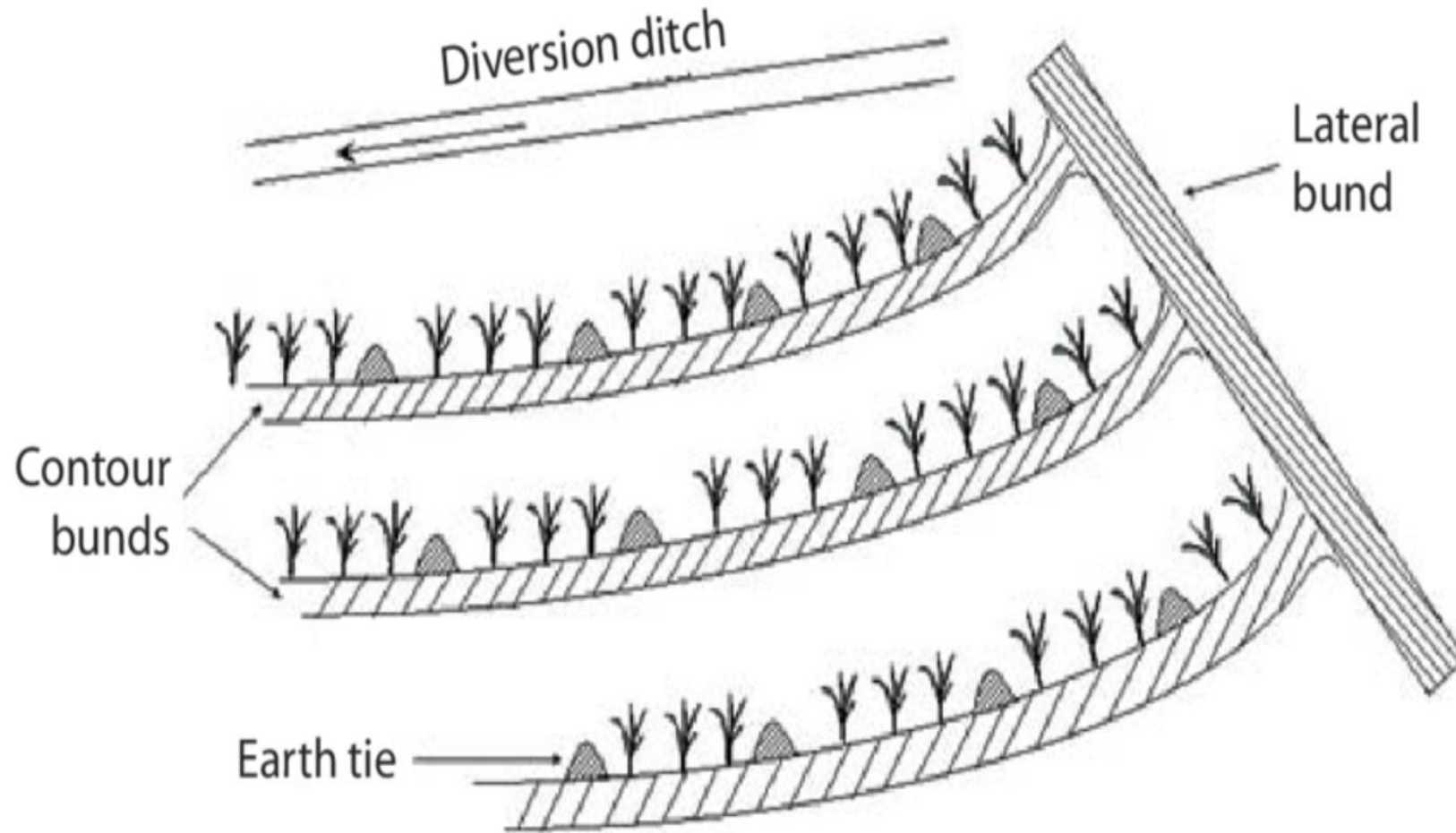


- **Contour bunding** (or contour bundling), involves the placement of lines of stones along the natural rises of a landscape.



- Contour bunding is a **soil and water conservation technique** where **small earthen embankments** are built across the slope of the land along contour lines to reduce runoff, prevent soil erosion, and improve water infiltration, especially in hilly or sloping area.
- It helps to **capture and hold rainfall** before it can become runoff.
- It also **inhibits wind erosion** by keeping the soil heavy and moist.





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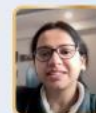
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Q. Consider the following agricultural practices:

1. Contour bunding
2. Relay cropping
3. Zero tillage

In the context of global climate change, which of the above helps/help in carbon sequestration/storage in the soil?

- a) 1 and 2 only
- b) 3 only
- c) 1, 2 and 3
- d) None of them

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Q. In India, the problem of soil erosion is associated with which of the following?



- 1. Terrace cultivation
- 2. Deforestation
- 3. Tropical climate

Select the correct answer using the code given below.

- a) 1 and 2 only
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Q).Which of the following statements can help in water conservation in agriculture?



1. Reduced or zero tillage of the land
2. Applying gypsum before irrigating the field
3. Allowing crop residue to remain in the field

Select the correct answer using the code given below:

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- **No-till farming (also called zero tillage or direct drilling)** is a way of growing crops or pasture from year to year without disturbing the soil through tillage.
- No-till is an agricultural technique which increases the amount of water that infiltrates into the soil and increases organic matter retention and cycling of nutrients in the soil.
- Gypsum (calcium sulfate) is used to improve soil structure in sodic soils (saline-alkali soils) by replacing sodium ions with calcium ions.
- However, it does not directly help in water conservation.
- Gypsum **improves soil permeability**, but this effect is limited to sodic or clay-rich soils – in most other cases, it has little to no impact on water conservation.



Q.) What is/are the advantage/ advantages of zero tillage in agriculture?



1. Sowing of wheat is possible without burning the residue of previous crop.
2. Without the need for nursery of rice saplings, direct planting of paddy seeds in the wet soil is possible.
3. Carbon sequestration in the soil is possible.

Select the correct answer using the code given below:

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- Zero -till farming is a way of growing wheat crops without tillage or disturbing the soil in harvested fields. Happy Seeder is one of the unique techniques which is used for sowing seed without any burning of Crop residue.
- Direct seeded rice (DSR) has received much attention because of its low - input demand. It involves sowing pre-germinated seed into a puddled soil surface (wet seeding), standing water (water seeding) or dry seeding into a prepared seedbed (dry seeding).
- Adopting no -tillage in agro -ecosystems has been widely recommended as a means of enhancing carbon (C) sequestration in soils.

Q).With reference to the circumstances in Indian agriculture, the concept of "Conservation Agriculture" assumes significance. Which of the following fall under the Conservation Agriculture?

1. Avoiding the monoculture practices
2. Adopting minimum tillage
3. Avoiding the cultivation of plantation crops
4. Using crop residues to cover soil surface
5. Adopting spatial and temporal crop sequencing/crop rotations

Select the correct answer using the code given below:

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



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- **Conservation Agriculture** is a set of soil management practices that minimize the disruption of the soil's structure, composition and natural biodiversity.
- Despite high variability in the types of crops grown and specific management regimes, all forms of conservation agriculture share three core principles. These include:
 - **maintenance of permanent or semi -permanent soil cover** (using either a previous crop residue or specifically growing a cover crop for this purpose) ;
 - **minimum soil disturbance** through tillage (just enough to get the seed into the ground) ;
 - **regular crop rotations** to help combat the various biotic constraints.



Q. With reference to micro-irrigation, which of the following statements is/are correct?



1. Fertilizer/nutrient loss can be reduced.
2. It is the only means of irrigation in dry land farming.
3. In some areas of farming, receding of ground water table can be checked.

Select the correct answer using the codes given below:

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- Micro-irrigation methods like **drip irrigation and sprinkler irrigation** allow for **precise delivery of water and nutrients** directly to the root zone of plants.
- This reduces **nutrient runoff and leaching**, enhancing fertilizer efficiency and minimizing wastage.

Q.) What are the advantages of fertigation in agriculture?



1. Controlling the alkalinity of irrigation water is possible.
2. Efficient application of Rock Phosphate and all other phosphatic fertilizers is possible.
3. Increased availability of nutrients to plants is possible.
4. Reduction in the leaching of chemical nutrients is possible.

Select the correct answer using the code given below:

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- **Fertigation has some specific advantages over broadcast and band fertilization:**



- **A frequent supply of nutrients reduces fluctuation of nutrient concentration in soil.**
- **There is efficient utilization and precise application of nutrients according to the nutritional requirements of the crop.**
- **Fertilizers are applied throughout the irrigated soil volume and are readily available to plants.**
- **Nutrients can be applied to the soil when soil or crop conditions would otherwise prohibit entry into the field with conventional equipment.**



- The pH of the irrigation water is of great importance, as it affects many chemical reactions. In fertigation, the reasons for adjusting the pH to an optimal range are:



- To allow **optimal uptake of nutrients**, especially micronutrients;
 - To keep the irrigation system free from clogging. Alkalinity of a fertigation system can be controlled by adding Acid. The injection of acid to the irrigation water should be, as much as possible, uniform and continuous, throughout the entire duration of the irrigation.
- Drip fertigation increases water and nitrogen use efficiency. Drip fertigation reduced dissolved inorganic and organic N leaching by 90%.



- Soluble fertilizers like urea, potash and a wide variety of fertilizer mixtures available in the market could be well mixed with irrigation water, filtered and then passed through the irrigation unit.
- Rock Phosphate and some other mineral fertilizers containing phosphorus are insoluble in water as well as in citric acid. They are suitable in strongly acid soils or organic soils.
- These fertilizers are given in green manured fields.
- The phosphorus is very slowly released by microbes at action and remains in soil for long time.
- Hence option (c) is the correct answer.



Q).Which of the following is/are the possible consequence/s of heavy sand mining in riverbeds?

1. Decreased salinity in the river
2. Pollution of groundwater
3. Lowering of the water table

Select the correct answer using the code given below:

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- c) 1 and 3 only
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- Excessive instream sand and gravel mining causes the degradation of rivers. Instream mining lowers the stream bottom, which may lead to bank erosion.
- Depletion of sand in the streambed and along coastal areas causes the deepening of rivers and estuaries, and the enlargement of river mouths and coastal inlets. It may also lead to saline -water intrusion from the nearby sea. The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system.
- Excessive instream sand mining is a threat to bridges, river banks and nearby structures. Sand mining also affects the adjoining groundwater system and the uses that local people make of the river.
- Sand aquifer helps in recharging the water table and sand mining causes sinking of water tables in the nearby areas, , drops leaving the drinking water wells on the embankments of these rivers dry. Turbidity increases at the mining site.



Q).With reference to agricultural soils, consider the following statements:

1. A high content of organic matter in soil drastically reduces its water holding capacity.
2. Soil does not play any role in the Sulphur cycle.
3. Irrigation over a period of time can contribute to the salinization of some agricultural lands.

Which of the statements given above is/are correct?

- a) 1 and 2 only
- b) 3 only
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- Organic matter affects both the chemical and physical properties of the soil and its overall health.
- Properties influenced by organic matter include: soil structure; moisture holding capacity; diversity and activity of soil organisms, both those that are beneficial and harmful to crop production; and nutrient availability.
- Increased levels of organic matter and associated soil fauna lead to greater pore space with the immediate result that water infiltrates more readily and can be held in the soil.
- The improved pore space is a consequence of the bioturbating activities of earthworms and other macro - organisms and channels left in the soil by decayed plant roots.



Q.) In India, the use of carbofuran, methyl parathion, phorate and triazophos is viewed with apprehension. These chemicals are used as



- a) pesticides in agriculture
- b) preservatives in processed foods
- c) fruit-ripening agents
- d) moisturizing agents in cosmetics



- Carbofuran, phorate, methyl parathion, monocrotophos, methyl demethon, prophenophos and triazophos are pesticides used in agriculture.



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Q.) In the context of India, which of the following is/are considered to be practice(s) of eco-friendly agriculture?



1. Crop diversification
2. Legume intensification
3. Tensiometer use
4. Vertical farming

Select the correct answer using the code given below:

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

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- b) 3 only
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- Option (d) is the correct answer: Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities.
- **Legume Intensification:** Legumes fix the atmospheric nitrogen, release in the soil high-quality organic matter and facilitate soil nutrients' circulation and water retention. Based on these multiple functions, legume crops have high potential for conservation agriculture, being functional either as growing crop or as crop residue.
- **Tensiometer Use:** A tensiometer in soil science is a measuring instrument used to determine the matric water potential in the vadose zone. When the water pressure in the tensiometer is determined to be in equilibrium with the water pressure in the soil, the tensiometer gauge reading represents the matric potential of the soil. Such tensiometers are used in irrigation scheduling to help farmers and other irrigation managers to determine when to water.



- **Vertical farming** is the practice of growing crops in vertically stacked layers. It often incorporates controlled - environment agriculture, which aims to optimize plant growth, and soilless farming techniques such as hydroponics, aquaponics, and aeroponics. In vertical farming, crops are grown indoors, under artificial conditions of light and temperature. Japan has been one of the early pioneers in vertical farming. It holds the largest share in the global vertical farming market.



Q.) What is the use of biochar in farming?



1. Biochar can be used as a part of the growing medium in vertical farming.
2. When biochar is a part of the growing medium, it promotes the growth of nitrogen-fixing microorganisms.
3. When biochar is a part of the growing medium, it enables the growing medium to retain water for longer time.

Which of the statements given above is/are correct?

- a) 1 and 2 only
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- Statement 1 is correct: As the use of soilless, hydroponic growing methods becomes more prevalent among crop producers, researchers are looking for new materials that can help growers save money, produce healthy plants, and contribute to sustainable practices. biochar, a charcoal-like material produced by heating biomass in the absence of oxygen, can help "close the loop" when used as a substrate for soilless, hydroponic tomato production. "This method could provide growers with a costeffective and environmentally responsible green-waste disposal method, and supplement substrate, fertilizer, and energy requirements.
- Statement 2 is correct: Biochar has the potential to boost the natural ability of legumes to fix nitrogen to the soil. Adding biochar to soil not only provides a way to sequester carbon, but also has many soil health benefits



which will help farmers adapt to climate change and increase productivity. In addition to supporting the life of nitrogen - fixing microorganisms, biochar can also decrease soil N_2O emission, and increase nitrogen use efficiency and nitrogen retention in the soil.



- Statement 3 is correct: Because of its porous nature, biochar can improve your soil's water retention and water holding capacity – defined as the amount of water that a soil can hold for its crops – so that your plants will have more water available to them for a longer period of time.



Q.) How is the permaculture farming different from conventional chemical farming?



1. Permaculture farming discourages monocultural practices but in conventional chemical farming, monoculture practices are predominant.
2. Conventional chemical farming can cause increase in soil salinity but the occurrence of such phenomenon is not observed in permaculture farming.
3. Conventional chemical farming is easily possible in semi - arid regions but permaculture farming is not so easily possible in such regions.
4. Practice of mulching is very important in permaculture farming but not necessarily so in conventional chemical farming.



Select the correct answer using the code given below:

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



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Select the correct answer using the code given below:

a) 1 and 3

b) 1, 2 and 4

c) 4 only

d) 2 and 3



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- Permaculture is, amongst others, an approach to land management that adopts arrangements observed in flourishing natural ecosystems. It includes a set of design principles derived using whole systems thinking. It uses these principles in fields such as regenerative agriculture, rewilding, and community resilience.
- Permaculture discourages monoculture and serves to open up the possibility of growing a wide range of food grains, fruits and vegetables and thereby expanding the food basket; thus permaculture also contributes to community health. Hence, statement 1 is correct.
- Application of permaculture methods and introducing permaculture techniques like swales, natural mulching, rainfall harvesting, legume cultivation, have a clear role in improving soil properties, increasing soil organic matter content and reducing soil salinity. Hence, statement 2 is correct.



- Due to its focus on water conservation and region specific crops, it is very much suitable for arid and semi arid regions. Hence, statement 3 is not correct.
- Mulch is a material placed on the soil surface to maintain moisture, reduce weed growth, mitigate soil erosion and improve soil conditions. Mulching can help to improve crop yield and optimise water use which is an essential component of permaculture. Hence, statement 4 is correct.



Q. "System of Rice Intensification" of cultivation, in which alternate wetting and drying of rice fields is practised, results in:



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1. Reduced seed requirement
2. Reduced methane production
3. Reduced electricity consumption

Select the correct answer using the code given below:

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- System of Rice Intensification (SRI) was first developed in Madagascar in the 1980s and since then several countries in the world have been practicing it, including India. It promises to save 15 to 20% ground water, improves rice productivity.
- **Option 1 is correct:** Under SRI 2kg seed is required to grow a nursery for one acre against 5kg seed required in the traditional method.
- **Option 2 is correct:** SRI is a holistic approach to sustainable rice cultivation. By minimizing water use and alternating wet and dry conditions, it minimizes methane production.
- **Option 3 is correct:** With less consumption of water, adoption of SRI saves total energy inputs. A study found in Vietnam has also proved that applying SRI methods can save around 23% of energy inputs, while increasing energy outputs by 11%.



Q. Consider the following statements:



Statement-I:

According to the United Nations' World Water Development Report, 2022, India extracts more than a quarter of the world's groundwater withdrawal each year

Statement-II:

India needs to extract more than a quarter of the world's groundwater each year to satisfy the drinking water and sanitation needs of almost 18% of the world's population living in its territory

Which one of the following is correct in respect of the above statements?

- a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
- b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
- c) Statement-I is correct but Statement-II is incorrect
- d) Statement-I is incorrect but Statement-II is correct



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- While **India has 18% of the global population** and relies heavily on groundwater (e.g., ~85% of rural drinking water and significant urban/domestic supply), the **major driver of its high extraction is irrigation/agriculture** — about 89% of India's groundwater use is for irrigation (per the same report and related sources like CGWB/FAO).
- Domestic/drinking and sanitation needs account for a much **smaller share** (typically 9-10% or less of total extraction).
- The high withdrawal is not primarily "needed" for drinking/sanitation for 18% of the world population; it's largely due to **agricultural demands, overexploitation, and inefficiencies.**



Q. Which one of the following is the correct description of "100 Million Farmers"?



- (a) It is a platform for accelerating the transition towards food and water systems that are net-zero (carbon), nature-positive and that aims to increase farmer resilience.
- (b) It is an international alliance and a network of individuals and farming organisations interested in supporting and strengthening the development of the organic animal husbandry.
- (c) It is a digital platform fully integrated with service providers and built on blockchain that lets buyers, sellers and third parties trade fertilizers quickly and securely.
- (d) It is a platform with the mission of encouraging the farmers to form Farmer Product Organisations or Agribusiness Consortia, thus facilitating the access to global open markets to sell their products.



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RENEWABLE ENERGY



Q. Consider the following substances:

I. Ethanol

II. Nitroglycerine

III. Urea

Coal gasification technology can be used in the production of how many of them?

(a) Only one

(b) Only two

(c) All the three

(d) None



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- **Coal gasification** is the process of converting coal into a gaseous fuel, which is known as **syngas** which is made up of carbon monoxide and hydrogen.
- This gas can be used for **electricity generation**.
- This technology of coal gasification can be used in the production of **ethanol**(energy fuel) and **urea**(ammonia) but **not for the production of nitroglycerine** which is a vasodilatory drug used primarily to provide relief against chest pain.



Q. With reference to two non-conventional energy sources called 'coal bed methane' and 'shale gas', consider the following 'statements':



1. Coal bed methane is the pure methane gas extracted from coal seams, while shale gas is a mixture of propane and butane only that can be extracted from fine-grained sedimentary rocks.
2. In India abundant coal bed methane sources exist, but so far no shale gas sources have been found.

Which of the statements given above is/are correct?

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



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- India has **abundant coal bed methane (CBM)** reserves, especially in states like **Jharkhand, Madhya Pradesh, Chhattisgarh, and West Bengal.**
- Shale gas reserves **do exist** in India.
 - The **Cambay Basin** (Gujarat)
 - The **Krishna-Godavari Basin**
 - The **Damodar Valley Basin**
- However, commercial production of shale gas in India is still at a nascent stage due to technical and environmental challenges



Q. With reference to technologies for solar power production, consider the following statements:



1. 'Photovoltaics' is a technology that generates electricity by direct conversion of light into electricity, while 'Solar Thermal' is a technology that utilizes the Sun's rays to generate heat which is further used in electricity generation process.
2. Photovoltaics generates Alternating Current (AC), while Solar Thermal generates Direct Current (DC).
3. India has manufacturing base for Solar Thermal technology, but not for Photovoltaics.

Which of the statements given above is / are correct?

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- c) 1, 2 and 3
- d) None

- Solar energy can be converted directly into **electrical energy (direct current, DC)** by photovoltaic (PV) cells commonly called solar cells.

Q. Consider the following statements:

1. The International Solar Alliance was launched at the United Nations Climate Change Conference in 2015.

2. The Alliance includes all the member countries of the United Nations.

Which of the statements given above is/ are correct?

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Q. 'Net metering' is sometimes seen in the news in the context of promoting the

- a) production and use of solar energy by the households/consumers
- b) use of piped natural gas in the kitchens of households
- c) installation of CNG kits in motor-cars
- d) installation of water meters in urban households

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Q. On which of the following can you find the Bureau of Energy Efficiency Star Label?

1. Ceiling fans
2. Electric geysers
3. Tubular fluorescent lamps

Select the correct answer using the code given below.

- a) 1 and 2 only
- b) 3 only
- c) 2 and 3 only
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Q.) In the context of proposals to the use of hydrogen - enriched CNG (H -CNG) as fuel for buses in public transport, consider the following statements:



1. The main advantage of the use of H -CNG is the elimination of carbon monoxide emissions.
2. H -CNG as fuel reduces carbon dioxide and hydrocarbon emissions.
3. Hydrogen up to one -fifth by volume can be blended with CNG as fuel for buses.
4. H -CNG makes the fuel less expensive than CNG.

Which of the statements given above is/are correct?

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- HCNG is a hydrogen-enriched compressed natural gas (CNG).
- HCNG is a blend of hydrogen and CNG, the **ideal hydrogen concentration being 18%**.
- Compared to conventional CNG, use of H - CNG can reduce emission of carbon monoxide up to 70% and 15% reduction in total hydro carbon emissions, besides enabling up to 5% savings in fuel.
- For consumers who pay Rs 42 per kg for CNG, the cost of H -CNG would not be more than Rs 43 per kg.



Q. Consider the following heavy industries:



1. Fertilizer plants
2. oil refineries
3. Steel plants

Green hydrogen is expected to play a significant role in decarbonizing how many of the above industries?

- a) Only one
- b) Only two
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Q. With reference to green hydrogen consider the following statements

1. It can be used directly as a fuel for internal combustion.
2. It can be blended with natural gas and used as fuel for heat or power generation.
3. It can be used in the hydrogen fuel cell to run vehicles.

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Q. Which one of the following is the exhaust pipe emission from Fuel Cell Electric Vehicles, powered by hydrogen?



- (a) Hydrogen peroxide
- (b) Hydronium
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Q.) According to India's National Policy on Biofuels, which of the following can be used as raw materials for the production of biofuels?



1. Cassava
2. Damaged wheat grains
3. Groundnut seeds
4. Horse grams
5. Rotten potatoes
6. Sugar beet

Select the correct answer using the code given below:

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

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- Under the **National Policy on Biofuels** 'bioethanol' is defined as ethanol produced from biomass such as sugar containing materials, like sugar cane, sugar beet, sweet sorghum etc.; starch containing materials such as corn, cassava, rotten potatoes, algae etc.; and, cellulosic materials such as bagasse, wood waste, agricultural and forestry residues or other renewable resources like industrial waste.
- For Ethanol Production the following raw materials may be potentially used: B-Molasses, Sugarcane juice, biomass in form of grasses, agriculture residues (Rice straw, cotton stalk, corn cobs, saw dust, bagasse etc.) , sugar containing materials like sugar beet, sweet sorghum, etc. and starch containing materials such as corn, cassava, rotten potatoes etc., **Damaged food grains like wheat, broken rice etc.** which are unfit for human consumption, Food grains during surplus phase.
- **Algal feedstock and cultivation of sea weeds** can also be a potential feedstock for ethanol production.



- For **Biodiesel Production:** Nonedible Oilseeds, Used Cooking Oil (UCO), Animal tallow, Acid Oil, Algal feedstock etc.
- For **Advanced Biofuels:** Biomass, MSW, Industrial waste, Plastic waste etc.



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GENERAL STUDIES

Q).It is possible to produce algae based biofuels, but what is/are the likely limitation(s) of developing countries in promoting this industry?



1. Production of algae based biofuels is possible in seas only and not on continents.
2. Setting up and engineering the algae based biofuels production requires high level of expertise/ technology until the construction is complete.
3. Economically viable production necessitates the setting up of large scale facilities which may raise ecological and social concerns.

Select the correct answer using the code given below:

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- b) 2 and 3 only
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- b) 2 and 3 only**
- c) 3 only
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- **Algae-based biofuels** can be produced on **land as well** using artificial ponds, bioreactors, and controlled environments.
- Production is **not restricted to seas**; it is possible to grow algae in fresh water or closed systems on continents.



Q. Consider the following materials:

1. Agricultural residues
2. Corn grain
3. Wastewater treatment sludge
4. Wood mill waste

Which of the above can be used as feedstock for producing Sustainable Aviation Fuel?

- (a) 1 and 2 only
- (b) 3 and 4 only
- (c) 1, 2, 3 and 4
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- **Sustainable aviation fuel (SAF)** is a type of fuel that can be used in airplanes to reduce greenhouse gas emissions.
- It is made from **various sources**, including Corn grain, Oil seeds, Algae, Agricultural residues, Forestry residues, Wood mill waste, Municipal solid waste streams, Wet wastes (manures, wastewater treatment sludge), Dedicated energy crops etc.



Q.) Consider the following statements:



1. The Sustainable Development Goals were first proposed in 1972 by a global think tank called the 'Club of Rome'.
2. The Sustainable Development Goals have to be achieved by 2030.

Which of the statements given above is/are correct?

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- The **Sustainable Development Goals (SDGs) or Global Goals** are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all".
- The SDGs were set up in **2015 by the United Nations General Assembly (UN-GA)** and are intended to be achieved by 2030.
- The '**Club of Rome**' is a global think tank which in its 1972 book "Limits to Growth" talked about sustainability.



Q.) With reference to 'Agenda 21', sometimes seen in the news, consider the following statements:



1. It is a global action plan for sustainable development.
2. It originated in the World Summit on Sustainable Development held in Johannesburg in 2002.

Which of the statements given above is/are correct?

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- **Agenda 21** is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development.
- It is a **comprehensive plan of action to be taken globally, nationally and locally** by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment.
- It is a product of the **Earth Summit (UN Conference on Environment and Development)** held in Rio de Janeiro, Brazil, in 1992.
- Agenda 21 initiative is that every **local government** should draw its own local Agenda 21.
- Its aim initially was to achieve global sustainable development by 2000, with the "21" in Agenda 21 referring to the original target of the 21st century



Q. Consider the following statements regarding 'Earth Hour'

1. It is an initiative of UNEP and UNESCO.
2. It is a movement in which the participants switch off the lights for one hour on a certain day every year.
3. It is a movement to raise the awareness about the climate change and the need to save the planet.

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- "Earth Hour" is NOT an initiative of **UNEP and UNESCO**.
- It is a global movement organized by the **World Wide Fund for Nature (WWF)**, first started in Sydney, Australia in 2007.
- Earth Hour is observed by switching off non-essential lights for **one hour** on the **last Saturday of March** every year to raise awareness about environmental issues.
- **March 28, 2026** and **Time** - 8:30 pm to 9:30 pm
- Celebrating the **20th anniversary** of Earth Hour! It's branded as the "**Biggest Hour for Earth**"
- The movement aims **to raise awareness about climate change** and the importance of environmental conservation.



Q).The Partnership for Action on Green Economy (PAGE), a UN mechanism to assist countries transition towards greener and more inclusive economies, emerged at

- a) The Earth Summit on Sustainable Development 2002, Johannesburg
- b) The United Nations Conference on Sustainable Development 2012, Rio de Janeiro
- c) The United Nations Framework Convention on Climate change 2015, Paris
- d) The World Sustainable Development Summit 2016, New Delhi.



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- Partnership for Action on Green Economy (PAGE) is a **United Nations initiative** that supports countries in transitioning to **inclusive, sustainable, and green economies**.
- Launched in **2013 following the Rio+20 Conference**, PAGE helps integrate environmental sustainability, social equity, and economic growth into national policymaking.
- PAGE puts **sustainability at the heart of global economic policymaking**.
- It reframes economic practices to foster growth while creating jobs, reducing poverty and inequality, and strengthening ecological foundations.
- The initiative **aligns with the 2030 Agenda for Sustainable Development, the Paris Agreement, and related biodiversity targets**, with a strong emphasis on SDG 8 (decent work and economic growth).



Q. Consider the following statements regarding World Toilet Organization:



1. It is one of the agencies of the United Nations.
2. World Toilet Summit, World Toilet Day and World Toilet College are the initiatives of this organization, to inspire action to tackle the global sanitation crisis.
3. The main focus of its function is to grant funds to the least developed countries and developing countries to achieve the end of open defecation.

Which of the statements given above is/are correct?

- (a) 2 only
- (b) 3 only
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Which of the statements given above is/are correct?

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- The World Toilet Organization (WTO) is **NOT an agency of the United Nations.**
- It is a global **non-profit organization founded** in 2001 in Singapore to address sanitation issues.
- The WTO organizes the World Toilet Summit, celebrates **World Toilet Day** (on November 19), and established the **World Toilet College** to inspire action and address global sanitation challenges.
- The WTO's main focus is on **advocacy, capacity building, and policy influence** — it **does not** provide direct funding to countries for ending open defecation.



Q. Consider the following:



1. Battery storage
2. Biomass generators
3. Fuel cells
4. Rooftop solar photovoltaic units

How many of the above are considered "Distributed Energy Resources"?

- (a) Only one
- (b) Only two
- (c) Only three
- (d) All four



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- **Distributed Energy Resources (DERs)** refer to **small-scale electricity generation or storage units** that are located close to where electricity is used, such as homes, businesses, and industrial facilities.
- DERs often connect to the grid at the distribution level and provide flexible, decentralized power solutions

Q. Which one of the following best describes the term "greenwashing"?

- A. Conveying a false impression that a company's products are eco-friendly and environmentally sound
- B. Non-inclusion of ecological/environmental costs in the Annual Financial Statements of a country
- C. Ignoring the disastrous ecological consequences while undertaking infrastructure development
- D. Making mandatory provisions for environmental costs in a government project/programme



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Greenwashing	Misleading claims or actions by an organisation to portray its products, policies, or activities as environmentally friendly without substantial environmental benefits.
Bluewashing	Use of association with the United Nations, SDGs, or global development frameworks to appear socially responsible without genuine adherence to their principles.
Pinkwashing	Projecting support for women's rights or LGBTQ+ causes to divert attention from discriminatory or unethical practices.
Purplewashing	Superficial commitment to gender equality through symbolic actions without structural or policy-level change.



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