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Subject : Environmental Science.

→ Q. No. 1.

What meant by smog? ^{Explain} what
main causes of smog in Punjab
Summarise the effect of key meteorological
factors on dispersion of pollutants
in the atmosphere.

⇒ (1) What is meant by smog:-

Smog is the term derived from two words smoke and fog. It is a kind of intense air pollution. This kind of visible air pollution is composed of nitrogen oxides, sulphur oxides, ozone, smoke and other particulates.

Man made smog is derived from coal combustion emissions, vehicular emissions, industrial emissions, forest and agricultural fires and photochemical reactions of these emissions.

⇒ (2) How is smog created?

Smog is the result of the reaction of emissions from automobiles, factories and industries with the sunlight

and atmosphere.

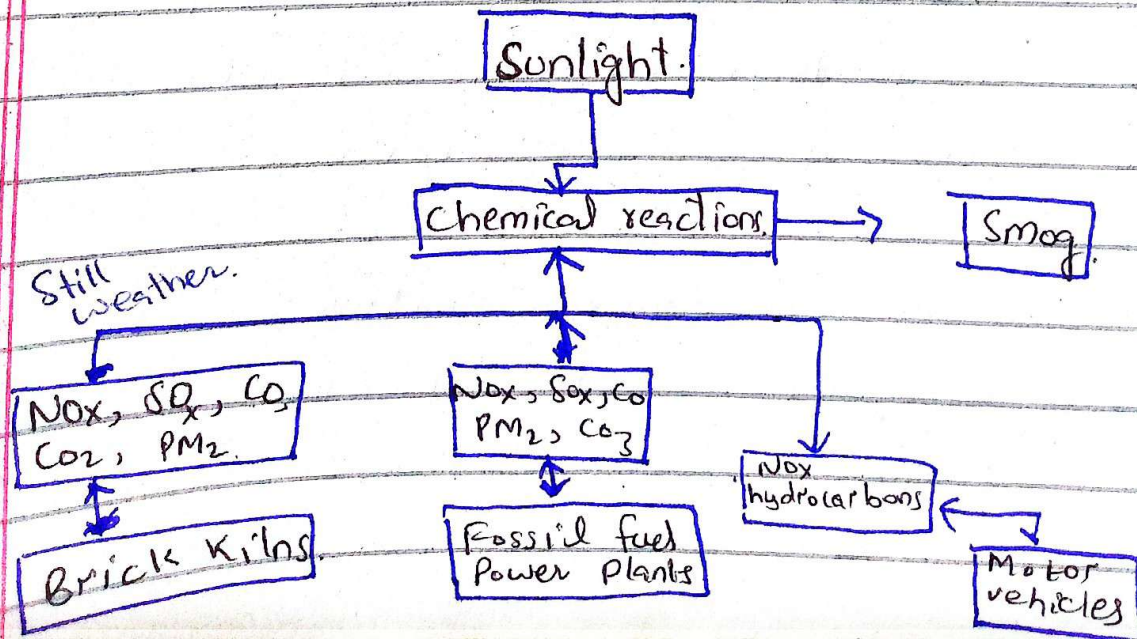
⇒ (3) Types of Smog:-

- (i) Classical Smog.
- (ii) Photochemical Smog.
- (iii) Polish Smog.
- (iv) Natural Smog.

⇒ (4) Causes Smog effects on human:-

The severity of smog hazards depends upon the quantity inhaled.

- (i) Respiratory disease.
- (ii) Lung cancer.
- (iii) Cardiovascular diseases.
- (iv) Asthma.
- (v) Diabetes.
- (vi) Headache.
- (vii) Skin disease.



⇒ (5) Main Causes of Smog in Punjab:-

Smog in Punjab, particularly in cities like Lahore, is a severe environmental issue caused by a combination of factors.

i.

Crop Residue Burning:-

Agricultural residue burning in neighboring regions, especially in Indian Punjab and Haryana, significantly contributes to smog in Punjab. This practice releases large amounts of pollutants into the atmosphere, including particulate matter (PM_{2.5}), carbon monoxide and volatile organic compounds.

ii.

Vehicular Emissions:-

The increasing number of vehicles on the road particularly in urban areas, emits substantial amounts of pollutants which contribute to smog formation.

iii.

Industrial Activities:-

Industrial processes and emissions from factories and manufacturing units also release pollutants into the atmosphere adding to the smog problem.

(iv)

Meteorological Conditions:-

Punjab's geography and climate play a significant role in trapping pollutants, exacerbating the smog problem. Temperature inversions during winter months also contribute to poor air quality.

(v)

Transboundary Pollution:-

Transboundary pollution is another factor contributing to smog in Punjab, as pollutants from neighboring regions and countries can travel long distances and impact air quality.

(vi)

Volatile Organic Compounds:-

Volatile organic compounds contribute to smog formation and impact public health and the environment. VOCs are emitted by vehicles, industries, and crop residue burning making them a significant concern.

(vii)

Lack of Effective Regulations:-

Lack of effective regulations and enforcement contributes to smog. Inadequate monitoring and enforcement of emissions standards worsen air quality.

(viii)

Population growth and Urbanization:-

Rapid population growth and urbanization contribute to smog. Increasing population density and vehicle numbers worsen air quality.

⇒ (6) Meteorological Factors Affecting Pollutant Dispersion:-

(i)

Wind Direction and speed:-

Wind direction determines the path pollutants will take, while speed influences the rate of dispersion. Changes in wind direction can shift the affected area.

(ii) Precipitation:-

Precipitation removes pollutants from the atmosphere through wet deposition. Rainfall can significantly reduce pollutant concentrations.

(iii) Solar Radiation:-

Solar Radiation influences atmospheric stability and mixing. Increased radiation enhances vertical mixing and dispersion.

Solar radiation affects atmospheric chemistry and pollutant formation.

(vi) Atmospheric Pressure:-

Atmospheric pressure influences wind patterns and pollutant dispersion. Pressure systems can impact pollutant transport and diffusion.

(v) Topography:-

Topography affects local wind patterns and pollutant dispersion. Valleys and mountains can trap pollutants or alter wind flows. Topography is a crucial factor in air quality management and modeling.

(vi) Visibility:-

Visibility is an indicator of air quality and pollutant concentrations. Reduced visibility can result from high pollutant levels. Visibility reduction can have implications for transportation and daily activities.

(vii) Humidity:-

Humidity affects pollutant dispersion and chemical reactions. High humidity can lead to aerosol formation and increased particulate matter.

(viii) Temperature Inversion:-

Temperature inversion occurs when a layer of warm air forms over cooler air, trapping pollutants. This phenomenon reduces vertical mixing and dispersion.

⇒ (7) Conclusion:-

Smog in Punjab is a complex issue caused by a combination of factors, including crop residue burning, vehicular emissions, industrial activities, and meteorological conditions. The effect of key meteorological factors, such as wind direction and speed, temperature inversion, and atmospheric stability, plays a significant role in dispersion of pollutants in the atmosphere.

By addressing the root cause of smog and working together, Punjab

can improve air quality and protect
public health.
