Environmental Chemistry

Question1

Identify the correct statements from the following

I. Photochemical smog has high concentration of oxidising agents.

II. NO_2 is present in classical smog.

III. Higher concentration of SO_2 in air can cause stiffness of flower buds.

IV. pH of rain water is approximately 7.5 .

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Options:

A.

I and III

B.

I and II

C.

III and IV

D.

II and III

Answer: A

Solution:

The correct statements are given in I and III. While II and IV are incorrect. Their correct forms are,

II. NO_2 is not present in classical smog. It consist of SO_2, fog, smoke.

IV. pH of rain water is around 5.6 .

Question2

Among the following compounds, which one is not primarily responsible for depletion of ozone layer in stratosphere?

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Options:

A.

NO

B.

CF_2Cl_2

C.

CH_4

D.

Cl_2

Answer: C

Solution:

🌍 Background:

The **depletion of the ozone layer** is mainly caused by **halogen (Cl, Br)** and **nitrogen oxides (NO_x)** that catalytically destroy ozone (O_3) molecules in the stratosphere.

The main culprits are:

- **CFCs (chlorofluorocarbons)** such as CF_2Cl_2 (Freon-12).
- **NO and NO_2** (from supersonic aircrafts, etc.) to a limited extent.

🔷 Option A: NO

- Nitric oxide (**NO**) can indeed react with ozone and participate in catalytic cycles that destroy ozone.
- So **NO does contribute** to ozone layer depletion.

✅ *Primarily responsible.*

🔷 Option B: CF_2Cl_2 (CFC-12)

- A chlorofluorocarbon that releases chlorine radicals ($Cl\cdot$) under UV light in the stratosphere.
- These radicals catalytically destroy ozone.
- CFCs are the **principal cause** of ozone layer depletion.

✅ *Primarily responsible.*

🔷 Option C: CH_4 (Methane)

- Methane does not destroy ozone directly.
- In fact, methane can **react with $Cl\cdot$ radicals**, forming HCl and thereby *reducing* the concentration of ozone-depleting radicals to some extent.
- It is not a major ozone-depleting substance.

🚫 *Not primarily responsible.*

🔷 Option D: Cl_2 (Chlorine gas)

- Though molecular chlorine can destroy ozone, it doesn't reach the stratosphere in large amounts due to high reactivity and solubility.
- However, under certain conditions, Cl_2 produced from CFC photolysis can release Cl atoms – so it is indirectly involved.

✅ *Can contribute, though not directly emitted into stratosphere.*

✅ **Final Answer:**

$\boxed{CH_4}$

Methane (CH_4) is **not primarily responsible** for depletion of the ozone layer in the stratosphere.

Question3

Eutrophication can lead to

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Options:

A. decrease in nutrients

B. increase in dissolved salts

C. decrease in dissolved oxygen

D. decrease in water pollution

Answer: C

Solution:

Eutrophication can lead to decrease in dissolved oxygen. Eutrophication is a phenomenon in which a water body become overly enriched with nutrients, leading to the plentiful growth of simple plant life. Excessive growth of algae and plankton is indicator of this process.

Question4

Which of the following industries generate nonbiodegradable wastes?

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Options:

A. Cotton mills

B. Thermal power plants

C. Paper mills

D. Textile factories

Answer: C

Solution:

Thermal power plants generates non-biodegradable waste such as fly ash.

Non-biodegradable waste is defined as a substance that cannot be decomposed naturally.

Question5

Acrolein (X) is one of the chemicals formed when O_3 and NO_2 react with unburnt hydrocarbons present in the polluted air. The structure of ' X ' is

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Options:

A. $CH_3 - CH = CH_2$

B. $CH_2 = CH - CHO$

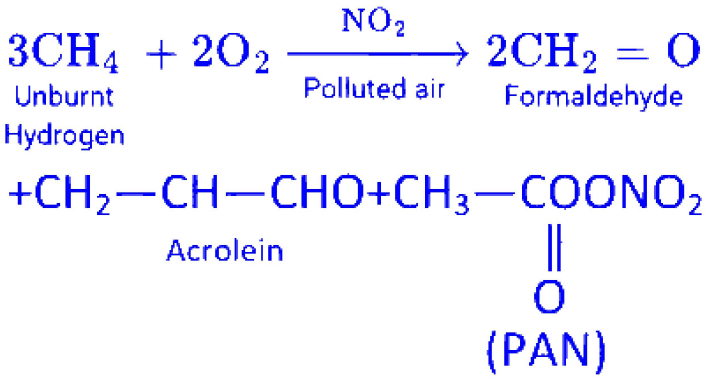
C. $CH_2 = CH - CN$

D. $CH_3CO(OO)NO_2$

Answer: B

Solution:

The complete reaction is as follows.



Hence, compound X is $CH_2 = CH - CHO$.

Question6

Methemoglobinemia is due to

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Options:

A. excess of nitrate concentration in drinking water.

B. excess of sulphate concentration in drinking water.

C. excess of fluoride concentration in drinking water.

D. excess of lead on drinking water.

Answer: A

Solution:

Methemoglobinemia is a rare blood disorder that effects how red blood cells deliver oxygen throughout the body.

One of the main reason behind is excess of nitrate concentration in drinking water.

Question7

The common components of photochemical smog are

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Options:

A. O_3, CH_4, CO_2

B. O_3, CO_2, CO

C. O_2, SO_3, PAN

D. O_3, NO, PAN

Answer: D

Solution:

Photochemical smog primarily consists of secondary pollutants that form when sunlight reacts with pollutants such as nitrogen oxides and volatile organic compounds (VOCs). The common components of photochemical smog include ozone (O_3), nitrogen oxides such as nitric oxide (NO), and peroxyacetyl nitrate (PAN).

Therefore, the correct combination is:

Option D

O_3 (ozone)
NO (nitric oxide)

PAN (peroxyacetyl nitrate)
