

Environmental Chemistry
CHU 3122 (2008 / 09)

Answer Guide to Assignment test I

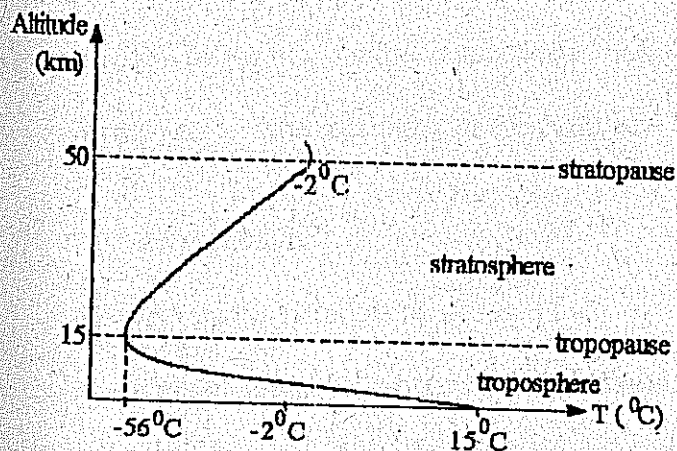
1(a) (i) Structure – Layer structure – consists of troposphere, Stratosphere, mesosphere, thermosphere.

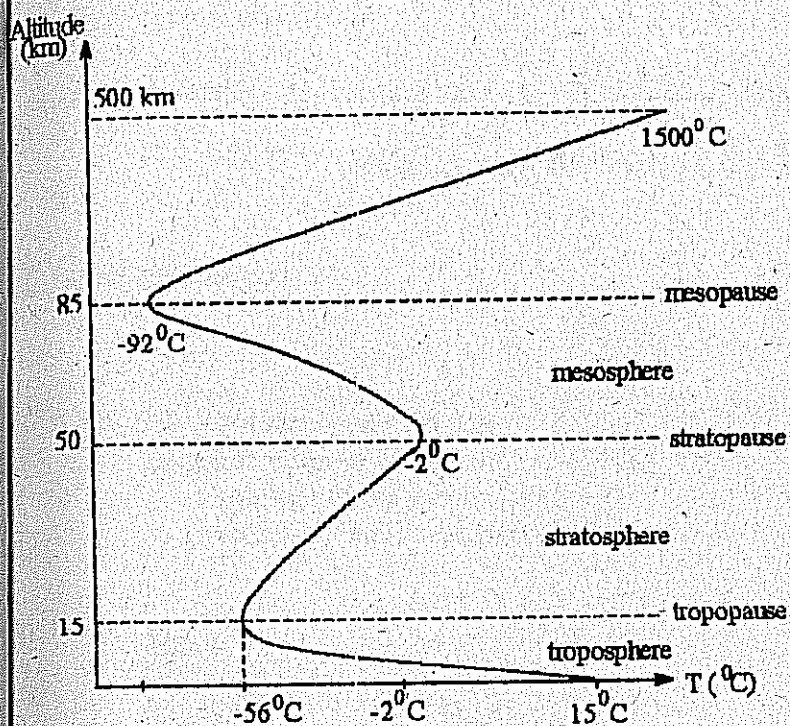
Function-

1. Acts as a protective blanket (O_3 absorbs UV in stratosphere)
2. Supports life (O_2)
3. CO_2 – maintains Earth's heat balance; photosynthesis
4. N_2 – nitrogen cycle
5. H_2O – hydrologic cycle

(ii) Refer pg no 9

(iii)





(b) (i) Source – origin of a particular substance / pollutant in a reservoir

sink – long – time repository of the pollutant

(ii) Carbon monoxide

Source- partial combustion of fossil fuel

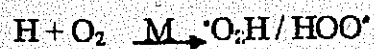
forest fires or

as an intermediate in (tropospheric) oxidants of substances (CH₄, e.g)

Sinks

1) Uptake in soil, followed by microbial oxidation to CO₂

Atmospheric oxidation by ·OH:



Environmental effects

1.i) affects health – O_2 binding : $Hb-O_2 + CO \longrightarrow Hb-CO + O_2$

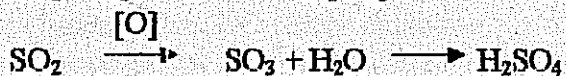
$\therefore$ reduces oxygen binding capacity of hemoglobin (Hb)

ii) greenhouse gas

2. (a) SO_2 – anthropogenic sources

(i) combustion of fossil fuel ($C-S + O_2 \longrightarrow$)
smelting of iron pyrites ($FeS + O_2 \longrightarrow$)
(roasting) (metal – sulphides)

Sinks



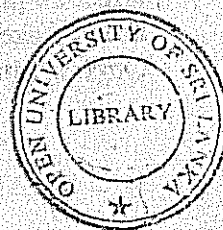
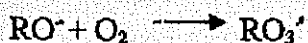
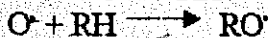
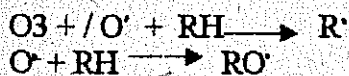
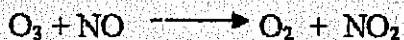
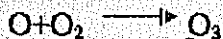
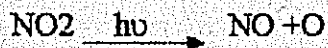
ii) Environmental effects:

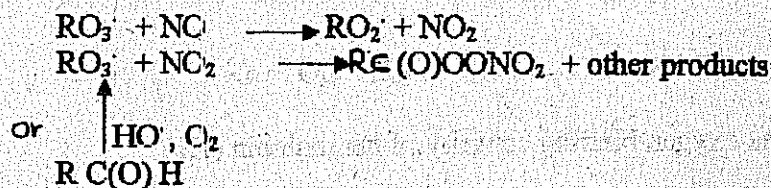
effects on vegetation (leaves) forest – leaf necrosis and chlorosis

Soil, water – (reduction of pH)

↓
reduces ion exchange capacity
human – respiratory tract

(b) (i) constituents present in photochemical smog – NO_2 , ozone, aldehydes, PAN





(ii) harmful effects

Respiratory problems – cough wheeze, irritation to respiratory system.

irritants to eye (PAN, aldehydes)

cracking of aging of rubber (O_3)

effect on plant – toxic - O_3 , nitrogenoxides and PAN (oxidants)

brown haze & reduced visibility (organic compounds- aldehydes and Organic nitrates)

c) RADON:

Source – soil, ground water, which equilibrates with under ground rocks.

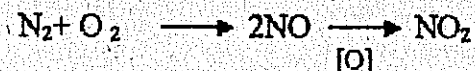
health effects – Rn is a gas; if inhaled, Rn / daughters get lodged in lungs and disintegrate giving α particles and daughter products (Po, Pb etc). α particles interact with matter removing electrons causing damage to (stem) cells.

Alteration of these cells lead to cancer.

3. (a) (i) NO_x

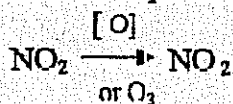
anthropogenic sources

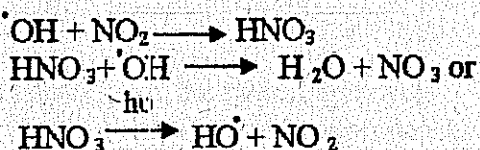
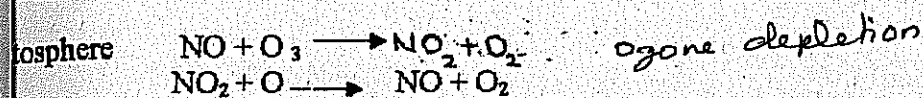
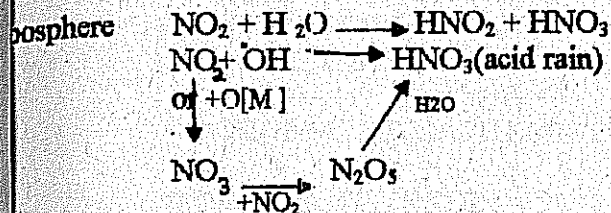
automobiles – internal combustion Engines:



Combustion of fossil fuels

Nuclear explosions





i.e., HNO_3 is a temporary sink for NO_2 in Stratosphere

ii) Environmental consequences:

Stratosphere: NO-Ozone depletion

Troposphere: NOx- Photochemical smog

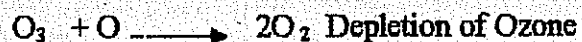
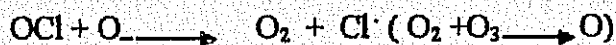
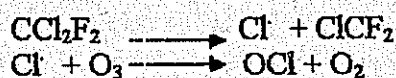
Greenhouse gas-Global warming,

Acid rain

b) i) Stratospheric Ozone-

O_3 absorbs dangerous UV from the sun (converting it to heat) and prevents it from reaching the earth. if it reaches the earth, it will be harmful to humans (skin cancer). therefore, O_3 in Stratosphere is beneficial to maintained.

ii) Chlorofluorocarbons- CFCs : CCl_2F_2 e.g.



CFCs are greenhouse gases, too. Therefore contributes to global warming.

iii) Important features: Less or fewer Chlorine or no Chlorine in the compound (having F or for in its place) and having H in the compound which makes it reactive in the troposphere itself, leaving no trace behind.