UNIT I

What are different segment of environment?

Environmental segments:

Environment can be divided into four segments

Atmosphere 2)Hydrosphere3)Lithosphere 4)Biosphere

Atmosphere :The gaseous layer around the earth is called atmosphere.The major components in the atmosphere are nitrogen and oxygen.The other componentsin the atmosphere are carbon dioxide,water vapour,noble gases etc.It absorbs a portion of electromagnetic radiation coming from the sun and transmits near UV, visible and near infrared radiations.Itplays an importantrole in maintaining the heatbalance on earth.

Hydrosphere:The region of environment related to water is called hydrosphere.It includes oceans,seas,rivers,lakes,streams,reservoirs,glaciers,polar ice caps,ground waters etc.

Water occupies 80%of the earth's surface.Out of this 97%is present in theform of sea water,2%is in the form ofice in polar ice caps and only 1%of water is available for drinking,agriculture and other human purposes.The growth and declineofthe ancient civilizations are closely linked to the water supply.The major uses of water are for irrigation and thermal power plants,while other uses are domestic and industrial consumption.

Lithosphere: The solid component of the earth is called lithosphere.It consists of soil,minerals,rocks,organic matter,mountains,hills etc.The soil is the most important part of the lithosphere.

Biosphere: The zone of living organisms in the environment is called biosphere.Plants,animals and human beings constitute the biosphere.Biosphere and other segments of the environment are inter related.It maintains the equivalent ratio of carbon dioxide and oxygen in the atmosphere.Biosphere is dependent on atmosphereand hydrosphere.

Define environmental chemistry.Write adverse effect of urbanisation andindustrialisation to environment?

A.Environmental chemistry: The environment around us is made up of ^{species}which undergo chemical reactions constantly

E.g.Photosynthesis in plants formation of ozone.

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Environmental chemistry deals with the study of such reactions which takes placein the origin,transport and life -cycle of chemical species in the environment"The growth of low-density development on the edges of cities and towns"are called urban.

Impacts of urbanisation:

Eliminate agricultural land

Results in increased improves surface.3)Traffic congestion

Green house gases

Increased population for suburbs. 6)Destructions of wildlife habitates..

Impacts of Industrialization:

Industrialization is the marked transformation of a society from agrarianto manufacturing or industrial.

Industrialization contributes to negative environmental externalities,suchas pollution,increased greenhouse gas emission and global warming.

The separation ofcapital andlabor creates a disparity inincomes betweenlaborers and those who control capital resources.

Industrialization also contributes to the deterioration of health amongworkers, crimes,stress and other societal problems.

Explain the nomenclature of environmental chemistry?

张Nomenclature of environmental chemistry:

Pollutant:A substance present in nature,in greater than natural abundance dueto human activity,which ultimately has a detrimental effect on the environment and there from on living organisms and man kind.

E.g.Lead,mercury.

Contaminant :A material which does not occur in nature,but is introducedby human activity into the environment,affecting its composition.

Eg Cz gas escaped from a detailed railway tank car near Youngstown.

Roceptor:The medium which is affected by a pollutant.Man is the receptorof photochemical smog causing irritation ofthe eyes and respiratory tract.

Sink:The medium which retains andinteracts with a longlivedpollutant.Amarble well will act as a sink for atmospheric H_2SO and ultimately get damaged.$H_2SO_4+CaCO_3 \rightarrow CaSO_4+H_2O+CO_2$

Rtwys of a pollutant:The pollutant is distributed form its source intothe cnvironmental segments

To food crops and food chain-$PbCl_2+PbBrz_2$

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Speciation :The different chemical forms or species oforganic,inorganiccompounds present in the environment.
Dissolvedoxygen(DO):Theamountofoxygenpresent inwater is called dissolvedoxygen.In the dissolved state oxygen is the most important of the various substances
present in water.Certain reducing substances use oxygen to get oxidised.The aquatic plants and animals also require oxygen for their existence.The amount of oxygen required for healthy growth of plants and animals in water is 4-6 mg L'.If the amount of dissolved oxygen in water is reduced dueto any reason the water is said to be polluted.On the basis of the DO value the extent ofpollution is usually estimated.
The methods for controlling pollution are also evolved on the basis of DO.The methods are (1)winkler method(2)polarographic method (3)Membrane Electrode
method.
Chemical oxygen,demand (COD):The amount of oxygen required to oxidiseorganics substances present in water is called Chemical oxygen demand (COD).
The oxidising agent used in the oxidation of organie substance in water ispotassium dichromate and 50%sulphuric acid.
If COD value increases,the water is said to be polluted.
Number of gram equivalents $K_2Cr_2O_7$=Number of gram equivalents of oxygen Weight of oxygen=Number of gram equivalents of oxygenx8
Biochemical oxygen demand (BOD):The amount of oxygen used by the suitablemicro organisms present in water during 5 days at 20°C is called Biochemical oxygen demand (BOD).
If BOD value increases,the water is said to be polluted.For pure water,BOD value is about 1ppm.The municipal sewage water has BOD value is 100-400 ppm. BOD greater than 17 ppm is harmful and highly polluted.

$$BOD = \frac{\text{Weight of } O_2 \text{ required in mg}}{\text{Volume of water sample in litres}}$$

$$= \frac{\text{Weight of } O_2 \text{ required in grams}}{\text{Million parts of sample}}$$

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COD and BOD values determine the extent of pollution of water.

Threshold lmit value (TLV):It indicates the permissible level of the pollutants orthe toxic substances that can be present in a mine or in an industry.The minimum level ofthe toxic substances or pollutants present in the atmospherewhich effects a person adversely when he is exposed to this for 7-8 hours in a day is called threshold limit value (TLV).

Explain the reaction of Hydrological cycle

The hydrological cycle :The hydrological cycle is a continuous natural process, whichhelps in exchange of water between the atmosphere,the land,the sea living plants and animals.About one-third of the solar flux absorbed by the earth is usedto drive the hydrological cycle,massive evaporation of water from the oceans,cloud formation and precipitation which provides us with our supply andreserves of fresh water.

The rain water on land surfaces seeps in to the soil as ground water.Below the groundwater,there is a natural water level or water table.The soil below the water table is sustained by the under lying clay and rock strata.Another importantunderground water resource is the aquifer.From these aquifers water can be extracted by sinking wells,tube wells and pumping it to the surface.Surface water or run-off flows into streams,rivers,lakes and catchment areas or reservoirs.The land surface and all water surfaces on the earth lose water by evaporation by solarenergy.Normal evaporation from the oceans exceeds precipitation by rain in to the seas by about 10 percent.This excess of 10 percent ultimately moves as water vapour over land surface there by balance the hydrological cycle and meets our requirements for additional water.Plants absorb capillary ground water but give off excess water through leaves by the process oftranspiration.

The hydrological cycle consists of a balanced continuous process of evaporation, transpiration,precipitation,surface run-off and ground water moments.

Write the reaction of atmospheric oxygen?

A.Oxygen is the major component of all living organisms.Its adequate supply is vital for sustenance of life in the biosphere.Oxygen is needed by most ofthe plantsand
animals and all human beings for aerobic respiration or enzymatic oxidation oforganic food,which sustains growth and general metabolism.Oxygen is absorbed from the environment during aerobic respiration butreleased by plantsduring photosynthesis
there by setting up the oxygen cycle.There is also continuous exchange of O_2 between the atmosphere and all water surfaces on the earth.The total amount of O,in the biosphere is relatively constant.So that oxygen cycle may get stable.Oxygen contributes largely to the processes on the earth's surface,it participates in

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combustion reactions.

$C+O_2 \rightarrow CO_2$ $CH_4+2O_2 \rightarrow CO_2+2H_2O$

Oxygen is consumed by some oxidative weathering process of minerals

$4FeO+O_2 \rightarrow 2Fe_2O_3$

Fe(I)consumed bulk of O_2giving large scale of Fe_2O_3

$4Fe^{2+}+O_2+4H_2O \rightarrow 2Fe_2O_3+8H$

Green plants return O,to the atmosphere through the process of photosynthesis.

$CO_2+H_2O+hv \rightarrow [CH_2O]+O_2$

Explain the concept and scope of environmental chemistry?

Concept of the environmental chemistry:Environmental chemistry is a multi- disciplinary science involving chemistry,physics,life sciences,agriculture,medicinalscience,public health and sanitary engineering.In simple terms "It is the science ofchemical phenomenon in the environment".In broader terms;"It is the study of the sources,reactions,transport,effect and fate of chemical species in the air,waterand soil and the effect of human activity upon these".

Scope of the environmental chemistry:Environmental chemistry is a part of environmental education.The objective ofan environmental education is to enlightenthe people,particularly students,about the importance of protection and conservationof our environment and the need to restrain human activities which lead to indiscriminate release ofpollutants into the environment.

Now a days there are many environmental issues are there which have grown insize and complexity day-by-day threatening the survival of mankind on earth.Howwere several Japanese killed by eating fish from minamata,why did 30004000 people die in London,why historic marble statues in Greece and Italy getting damagedby rain water,how did the Mediterranean sea turn into a dead sea why Ganga riverthe most polluted river in India,there are some typical chemical issues which can bebest handled in their chemical perspective.

Write about Naturalresources?

Natural resources;Natural resources are two types.

Metals and 2)Non -metals.

Metalresources;The rate of depletion ofresources is measured bytwo parameters. They arepercapita mining and percapita consumption.Percapita mining is calculated by dividing the amount ofresource mined by the population.Percapita consumption is obtained by dividing the amount ofresource actually processed by the population. Itis a better index of the standard of living of the population.Coal,petroleum,iron ore,aluminium and phosphate rock are demand on resources.

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lon-metal resources:The major non -metal resources are asbestos,carbonates Cl_2,granite,O_2,phosphate,potash,sand and gravel,Na compound and H_2O
Asbestos (silicate minerals),carbonates principally those of Ca and Mg.Sannd gravel together with granite,constitute the common and most widely used i,

Explain the importance of environmental chemistry

5.

Importance of environmental chemistry:

A

Environmental chemistry is the study of chemical processes occurring in the nvironment which are impacted by humankind's activities.These impacts ma pe felt on a local scale through the presence of urban air pollutants or toxi uhstances arising firoma chemical waste site or an a global scale,through depletiou of stratospheric ozone or global warming.The focus in our courses and research activities is upon developing a fundamental understanding of the nature of thes chemical processes,so that humankind's activities can be accurately evaluated.

Environmental chemistry involves first understanding how the uncontaminatedcnvironment works,which chemicals in what concentrations are presentnaturally,and with what effects without this it would be impossible to accurately study theeffects humans have on the environment through the release of chemicals.

Environmental chemists draw on a range of concepts from chemistry and various environmental sciences to assists in their study of what is happening to a chemical species in the environment.Important general concepts from chemistry include understanding chemical reactions and equations,solutions,units,sampling and analytical techniques.

Write the thermal power,nuclear power and atomic energy.

Thermal power:A thermal power station is a power station in which heat energyis converted to electric power.In most places the turbine is stream-driven.Wateris heated,tums into stream and spins a stream turbine which drives an electrical generator.After it passes through the turbine the stream is condensed in a condenser and recycled to where it was heated.This is known as a Rankine cycle.The greatest variation in the design of thermal power station is due to different heat sources,fossil fuel power generation,through nuclear heat energy,solar heat energy, biofuels and waste incineration are also used.Some power to use the term energy center because such facilities convert forms of heat energy into electrical energy, cerlainthermal power stations arealso designed to produgerey into electrical enersy Mtehstrietheating ordesalination of vater in addion to generating electrical powet.

Nuclear power;The nuclear energy obtained from the nucleus of an atom.Nuclear energy are two types.They are nuclear fission and nuclear fusion.

V-foroneelectron $=1.6\times10^{1}$columm

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W=1.6×10-19y

W=leV

Nuclear fission :The phenomenon of splitting of an heavy nucleus(uranium, plutonium,thorium)into lighter nuclei liberating large amount of energy by thebombof slowFission of 1kg of U-235 gives energy equivalent to 2500 tones of coal.

Atomic energy:Alomic energy is the source ofnuclear power,which uses sustained nuclear fission to generate heat and electricity.

Nuclear cnergy is the cnergy in the nucleus or core of an atom.As they split theatoms release tiny particles called fission products,they causes other uranium atomsto split,starting a chain reaction.The energy released from this chain reaction creates heat.energy

Give a detailed account on renewable and non renewable energy resources?

Renewable energy resources: Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human time scalesuch as sunlight,wind,rain,tides,waves and geothermal heat.These are sometimes called infinite energy resources.

Sources of renewable energy :There are many different sources of rer.ewableenergy.These sources are listed below.

Wind energy 2)Solar energy 3)Tidal energy 4)Geothermal energy

Biofuel (Bagasse,Animal dung)

Plant biomass energy.

Non -renewable energy resources:Resources that are available on the earth is limited quantity,it will vanish in the feature,it cannot be regenerated with in a short span of time,it exist in the form of fossil fuels,natural gas,oil and coal deposits. These are no environmental friendly and can have serious effect on human health.

Fossil fuels:Fossil fuels are sources of energy that formed from the accumulated remains of dead organisms that were buried millions of year ago.Pressure,heat and time allow the organic matter to transform into fossil fuels which are coal,oil and natural gas.Coal is the most abundant fossil fuel on the earth.It has served man kind since several decades.It is used in electricity generation

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Human made activities are increasing that amount of greenhouse gases like carbondiotide,methane,nitrogen oxides eic.Due to which the temperature of the
earth is increasing.
Carbon -dioxide is increasing due to indiscriminate gascous cmissions etc.The destruction of forests in large numbers is another reason for this.Forests control theamount of carbon dioxide naturally,but due to their wild harvesting,this natural control is also being left out of our hands.Irregular rains and melting of snow thathas been frozen for centuries are also happening due to climate change.
To stop climate change,we should plant more and more trees.The felling oftrees has to be stopped.Reduce harmful gases by reducing the use of petrol,dieseland electricity.

9、 Explain Renewable energy of Biomass and solar energy?

Renewable energy sources: Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human time scale such as sunlight,wind,rain,tides,waves and geothermal heat.These are some- times called infinite energy resources.
(A).Biomass :Green plants tap solar energy through the process of photosynthesis and convert it into organic matter.This organic matter is known as biomass.Wood,charcoal,agricultural waste produce the bio-energy after burning and cowdung garbage are decomposed to obtain the energy dried animal dung or cattle dung areused directly as fuels in rural area but it produces smoke and has low efficiency ofbuning.
Merit of Biomass: (1)Reliable
(2)Abundant (3)Carbon -Neutral(4)Waste reduction
Demerits of Biomass: (1)Requires space
(2)Green house gas emissions(3)Environmental impact (4)Inefficient
Solar Enorgy:The solar energy is collecting in the form of heat and using the heathesuch is the principle of solar energy devices,such as solar cooker,solar water heater or geyser.
The energy from the sun in the form of radiation is called solar energy.The 5000 tiionceofenormous energy.India receivers solar energy equivalent to over 5000 trillion kwh /year.

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UNIT -II

AIR POLLUTION

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LONG ANSWER TYPE QUESTIONS

Define and explain acid rain and give the adverse effects caused by acid rain.

] A.Acid rains:Rain water normally has a pt of5.6 due to the presence of Hions formed by the reaction of rain water with CO,present in the atmosphere.

If the p"of the rain water is less than 5.6,the rain water becomes acidic,thenit is called acid rain.Acid rain refers to the ways in which acid from the atmosphereis deposited on the earth's,surface.

The cause of the acid rain in the presence of oxides of sulphur and nitrogen in theatmosphere due to fossil fuel combustion and automobile exhausts respectively.

Oxides of nitrogen combine with oxygen and ozone to form higher oxides of nitrogen.These oxides dissolve in water to form nitric acid.

$NO+O_3 \rightarrow NO_2+O_2$ $NO_2+O_3 \rightarrow NO_3+O_2$

$NO_2+NO_3 \rightarrow N_2O_5$ $N_2O_5+H_2O \rightarrow 2HNO_3$

Sulphur dioxide reacts with oxygen and water to form sulphuric acid.

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$ $SO_3+H_2O \rightarrow H_2SO_4$

Nitric acid and Sulphuric acid obtained in the atmosphere dissolve in rain waterand come down to earth as rain.It is called acid rain.It has a pH of 4.5.

Effects of acid rain:

It cause extensive damage to buildings and statues made of marble,lime stone,slate or metal.The glossy nature of Tajmahal is getting affected due to the actionof acid rain on marble stones.

It corrodes water pipes resulting in the leaching of the heavy metals such as Fe,Pb and Cu into the drinking water which have toxic effects.

It dissolves heavy metals such as Pb,Cu,Hg and Al from the soil which enterwell waters and produce a variety of toxic effects.

Acid rain is harmful for agriculture,trees and plants as it dissolves and washesaway nutrients needed for their growth.

It causes respiratory problems in human beings and animals.

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6)When acid rain falls and flows as ground water to reach rivers,lakes etc.,itaffects plants and animals life in aquatic ecosystem.

Write about Photochemical smog.

Photochemical smog:When fossil fuels are burnt,a variety of pollutants are emitted into the earth's troposphere.Two of the pollutants that emitted are hydrocarbons and nitric oxide(NO).When these pollutants buildup to sufficiently high levels,a chain reaction occurs from their interaction with sunlight in which NO is converted into nitrogen dioxide (NO_3).This NO,intun absorbs energy fromsunlight and breaks up into nitric oxide and free oxygen atom.Oxygen atoms arevery reactive and combine with the O,in air to produce ozone.The ozone formedreacts rapidly wihnitric oxideto form NO2.Nitrogen dioxideis a brown gas andatsufficiently high levels can contribute to have.

$2NO)+O_2()\ \rightarrow 2NO_{21}g)$

$NO_2(s)\ \rightarrow NO(g)+0@)$

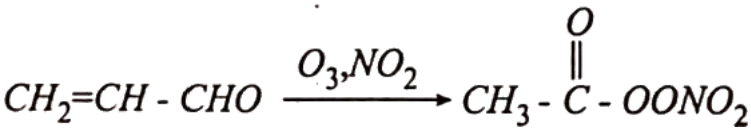
$0(_8)+O_2(g)O_3(_8)$

$NQ_2)+O_3(g)\rightarrow NO(_8)+O_2(_8)$

Ozone is a toxic gas and both $NO_2$and Os are strong oxidising agents and canreact with the unburnt hydro carbons in the polluted air to produce chemicals suchas formaldehyde,acrolein and peroxyacetyl nitrate (PAN).

$3CH_4+2O_3\rightarrow 3HCHO+3H_2O$

Formaldehyde



Acrolein Peroxyacetyl nitrate (PAN)

The common components of photochemical smog are ozone,nitric oxide,acrolein,formaldehyde and peroxyacetyi nitrate (PAN).

Effects of photochemical smog:

It causes serious health problems

i)Both ozone and PAN act as powerful eye irritants.

i Ozone and nitric oxide iriates the nose and throat and their high concentration aus n h eadache,chest pain,dryness of the throat,cough and difhiculy in reat g

Pholochemical smog leads to crnoking ofrubber and extensive damage to plantlife.

l.causes corrosion of meals,stones,building materials,rubber and paintedsurfaces.

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How·Is bzone layer depleted In the atmopshere and what are the harmrueffects caused by ozone depletion?

A..Ozone doplotlon:

ozone is 10 ppm.Itis called ozone layer.It docs not allow the harmful UV radiations coming from the sun to the surface of the carth,which protects us from the harmfu ultraviolet (UV)radiations coming from the sun.

Ozone in the stratosphere is a product of UV radiations acting on oxygen molecules.The UV radiations split apart molecular oxygen into free oxygen atoms. These oxygen atoms combine with the molecular oxygep to form ozone.

$O_2(g) \rightarrow 0_0)+0)$

$$O_{2(g)} + (O)_{(g)} \overset{UV}{\rightleftharpoons} O_{3(g)}$$

Ozone is thermodynamically unstable and decomposes to molecular oxygen.Thusa dynamic equilibrium exists between the production and decomposition of ozonemolecules

The process of decomposition of the ozone molecules in the stratosphere is calleddepletion of ozone layer.

The depletion of the protective ozone layer is due to the presence of chlorofluorocarbon compounds(CFCs),nitric oxide or chlorine in the stratosphere.

Chlorofluoro carbon compounds (CFCs):These are also known as freons.These compounds are non reactive,non flammable,non toxic organic molecules andtherefore used in refrigerators,air conditioners,in the production ofplastic foam and in the electronic industry for cleaning computer parts etc.Once CFCs are releasedin the atmosphere,they mix with the normal atmospheric gases and eventually reachthe stratosphere.In stratosphere,they get broken down by power full UV radiations,releasing chlorine free radical.The chlorine free radical then reacts with stratosphericozone to form chlorine monoxide radicals and molecular oxygen.Chlorine monoxideradicals react with ozone to form chlorine free radicals.The chlorine free radicalsare continuously regenerated and cause the break down of ozone.Thus CFCs are transporting agents for continuously generating chlorine free radicals into thestratosphere and damaging the ozone larger,

$$CF_2Cl_{2(g)} \xrightarrow{UV} \dot{C}l_{(g)} + \dot{C}F_2Cl_{(g)}$$

Ozone hole in Antarctica;It was found that a unique set of conditions was responsible for the ozone hole.In summer season,nitrogen dioxide and methane

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react wih cMoппe тopoxideand chorine atoms forming chorne sinks, preventngstratospheric clouds are formed over Antarctica. These polar stratosphenc cloud; cid and it also reacts with hydrogen chloride to give molecular chlorine. Whei sunlight returns to the Antarctica in the spring, the sun's warmlh breaks up telouds and hoc and CI are photolysed by sunlight to form chlorine free radicale
Tпe cпюгпe тгecтaшcaBв тиз Юппea, шпаге йе спатп геасйоп Ёог огопе дерТейопEfects of depletion of the ozone layer :
With he depleton ofozone layer, more UV radiaton flters into troposphere.

UV radiations lead to ageing ofskin, cataract, sun burn, skin cancer, killing ofmany phytoplanktons, damage to fish productivity etc.

й) The plant proteins get easily affectedby UV radiations whichleads to the harmfulmutation of cells.

й) It also increases evaporation ofsurface water tirough the stomata of theleavesand decreased the moisture content of the soil.

1v) lncrease in UV radiatons damage paints and fbres, causing them to fade faster.

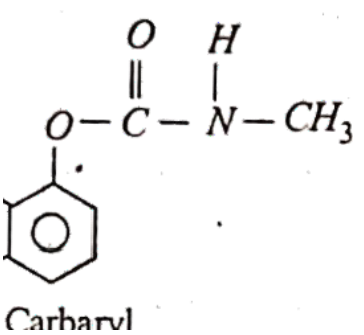
Explain the causes and consequences of Bhopal gas disaster?

A. Bhopal gas disaster: Date : December 3, 1984, venue-Bhopal, Madhya Pradeshimm Tndia.

Source; Union carbide factory, Manufacturer of carbaryl using methyl isocyanate(мic).

Producton: Мейylвocyanate (MIC)iste startng materaI for tпe ргодисйоп оГ carbary1

сн,мн,+сос!,—сн,-Мес=очгнсг
Methy amine Phosgent Methyl Isocyanat



Carbaryl

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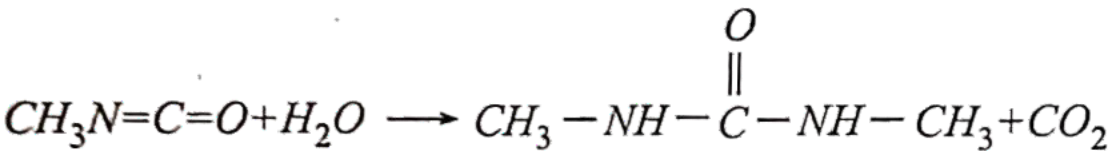
Mcthylaminc and phosgeneare pumped into areactorto formchilled methylisozyanateand HCl、The gaseous HCl separated in an absorber and the liquid MIC istransterred to carbamate production unit of storage tank.MIC is associated with unreacted $COCl_2$(2%).Ii is help to reaction between MIC and water and also polymerisation.Phosgene also provides Cl_2which can action container walls to produce substances that can serve as catalysts for reaction of MIC.

MIC is extremely reactive.It can react with many active hydrogen compounds. These reactions are vigorous and exothermic.MIC react with water and give 1,3- Dimethyl Urea

This reaction is also exothermic.



1,3-Dimethyl Urea

December 3,1984 it was a chilly windy night,in the union carbide faetory at about 11:30pm worker in the plant realised that there was MIC leak as their eyes were aching intensely.One worker noticed that the temperature gauge on one MIC

tank had reached 25°C,the top of its scale and pressure was rapidly building up to 40 psi.He rushed to the storage tanks of MIC and found that the concrete slab (60 Feet 6"thickness)above the storage tanks was shaking and the gas shooting out ofa tall stack connected to the tank and forming a white could drifting over the plant and towards the sleeping neighbourhood.In the plant he found that the pressure indicator had gone above 55 psi.The top of the scale and the-safety value had opened and releasing MIC from the storage tank.

People woke up coughing violently and with eyes burning as if chilli powder hadbeen sprayed in to them.The most victims were the children,they were unable towalk and breathe,they simply suffocated and died.Within a week about 10,000 people died,1000 people become behind and more than one lakh people continue to suffer from variousdisorders.

Explain controlling methods of air pollution?

The main sources of air pollutants are

1.Carbon Monoxide Cl2.Nitrogen Oxides NOx 3.Hydro carbons HC 4.Sulphur Oxides SO, 5.Perticulates

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Control of CO pollution:

Modification of exhaust system reactors which will complete the amounts of pollutants forming during fuel combustion

Development of exhaust system reactors which will complete the combustionprocess and potential pollutants into more acceptable materials

Development of substitute fuels for gasoline,which will yield low concentrationsofpollutants upon combustion.

Development of pollution free power sources to replace the internal combustion engine

Control of NO, pollution:

The fuel is fired ata relatively high temperature with a substoichiometric amountofair,say90-95%of the stoichiometric requirement.This yield of NO islimited in the absence of excess O_2.

Fuel burnout is completed at a relatively low temperature in excess air.Underthe above condition NO is not formed.

Control of Hydrocarbons pollution:

i)Reactive hydrocarbons from auto exhaust interact with $O_3$to form a hydro carbon-free radical RCH;

i)RCH?rapidly reacts with O2 to form fiee radical RCH_2O;

i RCH_2G;reacts with NO to produce NO,and the free radical $RCH_2O \cdot$ i)RCHO react with $O_2$to give stable aldehyde RCHO,and hydroperoxylradical

H_2O.

H_2O'then reacts with another molecule of NO to give $NO_2$and HO

HO·is externally reactive and rapidly reacts with a stable hydrocarbon RCH_3toyield H_2O and regenerate the hydrocarbon free radical RCH^2

All the reactions connected with hydro carbons are control of auto-exhaustemission.

Control of. SOx pollution:

Removal of SOx from fuel gases i).Removal of sulphur from fuel burningm Use oflow sulphur fuels iw Substitution of other energy sources for fuel combustion

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Control of particulate pollution:

Gravity settling chamber: Efluent gascs are led into a chamber which is large enough to permit gas velocitics to decrease and dust or droplets to settle.

Cyclone collector:A gas flowing in tight circular spiral produces a centrifugalforce on suspended particles,forcing them to move outward through the gas stream to a wall where they are collected.

Wet Scrubbers:These utilise a liquid to help remove solid,liquid or gascous contaminants.The extent of contact and interaction are increased by the use of spray chambers or towers where the liquid is introduced into the gas stream as fine spray

5.Write a short note on(1)climate change (2)Global warming.

A.Climate change :Climate change is a serious global challenge to day.Climate changeis an issue that the whose world is worried about and whose impact is felt by all of us.Climate change refers to the changes that occur in the earth's climate condition resulting in new weather that losts for a few decates or millions of years.These climate changes are having various impacts on the ecosystem and ecology.Due to these change we are facing serious problems like heavy storms,heat waves,floods,melting glaciers etc.

These are various causes trigger climate change.Some of these causes are natural,but the major portion of climate change is causing due to human activities.

Natural causes such as volcanic eruptions tectonic plate movement,ocean cur-rents Earth's orbital vibrations hugely contribute to climate change,but human ac-tivities have major negative impact on our environment such as deforestation,burn-ing fossil fuels,forming live stock etc.Generate an enormous amount of green house gases.This results in green house effect and global warming which are the major causing factor for climate change.

These climate change have a negative impact on the environment.The ocean level is rising,glaciers are melting,CO,in the air is increasing storms,volcanic eruptions and natural disasters occur frequently.Apart from that farest fires,wild life extinction,droughts are also caused due to climate change.

No doubt,climate change is one of the most serious problems that not only effectthe environment but also human beings.If we cannot prevent it as soon as possible,our world will face undesirable consequences.We must start contributing to our environment before it is too late.We have to take initiative and make energy one aware of the climate changes.

Global warming:

Global warming refers to gradual rise in the overall temperature of the atmosphere of the carth.There are various activities taking place which have been increasing the temperature gradually.Global warming is melting our ice glaciers rapidly.This is extremely harmful to the earth as well as humans.It is quite chal-lenging to control global warming.The first step in solving any problem is identifyingthe cause of the protection.

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Cause of global warming :It is not happening because of a single cause but severalcauses.These causes are both natural as well as man-made.The natural causes include the release of green house gases which are not able to escape from earth,causing the temperature to increase.Volcanic cruptions and methane are also big issues responsible for global warming.Man made causes are deforestation,min. ing,cattle rearing,fossil fuel burning and more.The excessive use of fossil fuel results is increased levels of carbondjoxide and due to deforestation,one of the biggest sources of absorption of carbondioxide will disappear and there will be noth-ng left to regulate the gas.Thus it will rest in global warming
Steps must be taken immediately to stop global warming.Global warming can bestopped by ajoint effort by the individuals and the government.We must begin with the reduction of green house gas.Deforestation must be banned and trees should be planted more.The use ofautomobiles must be limited and recycling mus be encour- aged.
In short,all of us mustrealize the fact that carth is not well.It needs to treatment and we can help itheal.Therefore,energy litle step,no matter how small carries a lot of weight and is quite significant in stopping global warming.
SHORT ANSWER TYPE QUESTIONS
What is Greenhouse effect and how it is caused.

A.Greenhouse effect or Global warming:The phenomenon ofheating up ofthe surface ofthe earth is called greenhouse effect or global warming.
The gases which cause global warming are carbon dioxide,water vapour,methane,nitrous oxide,ozone,CFCs etc.
The green house gases absorb infrared radiation coming to the earth and partly reflect it back to the earth's surface.As a resul,the surface of the carth gets heated up.So the temperature of the earth increases.This process is talled green house effect or global warming.
Higher the concentration ofthe green house gases in the atmosphere more is the infrared radiation trapped by these gases which is reflected back to the earth's surface and more is the global warming.
Methane is produced naturally when vegetation is burnt,digested or rotted in the absence of oxygen.Large amounts of methane are released in paddy fields,coal mines,from rotting garbage drumps and by fossil fuels.Chlorofluoro carbons(CFCs are man-made industrial chemicals used in air conditioning etc.Nitrous oxide occursmaturally in the environment.Their quantities have increased significantly due to theuse of chemical fertilizers and the burning of fossil fuels
etoctsofiarcon house effect;
there by flooding the coastal lands.

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ii)The rate of evaporation of water from the seas,rivers,ponas wiu 1leads to unseasonal rains,cyclones and hurricanes.

i)Agriculture sector will be badly effected due to facc evaporation of surface water.

iv)Higher global temperature is likely to increase the incidence of infectious diseasessuch as malaria,sleeping sickness,dengue and yellow fever.

Prevention of green house effect:Global warming may be controlled or stopped by growing trees and forests,stopping the production of CFCs etc.

Define air pollution?What are the main sources of air pollution?

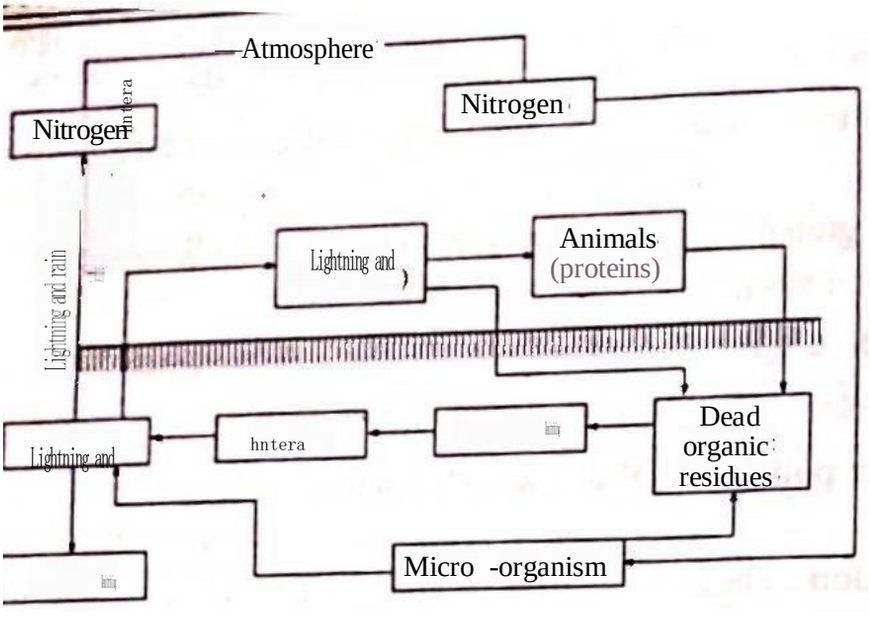
A.Air Pollution:The addition of undesirable materials into the atmosphere either due to natural phenomena or due to human activity on the carth which adversely effect the quality of the air and hence effects the life on the earth is called "air pollution" or atmospheric pollution.Atmospheric pollution is generally studied astroposphericand atmospheric pollution.The presence of ozone in the stratosphere prevents about99.5%of the sun's harmful ultraviolet radiations from reaching the earth's surface and there by protecting humans and other animals from its harmful effect

The main primary sources of pollutants which together contribute more than 90%of global air pollution. They are:

1.Carbon Monoxide CO2.Nitrogen Oxides NO_4 3.Hydro Carbons HC	6.Ozone7.CFC Smog
4.Sulphur Oxides $SO_2$5.Particulates	Dust Organic Pollutants.

Discuss about Nitrogen cycle in detail?

AN.itrogen cycle:Nitrogen and its compounds are essential for the maintenance of life processes in the biosphere.There is continuous exchange of nitrogen within ecosystem,operating the nitrogen cycle.Plants and animals continuously produceproteins,which are organic compounds containing nitrogen.Plants absorb nitrates from the soil to produce plants the death and decay of the plants and animals as wellas excreta of animals comprise the major load of organic residues containing proteinsto the soil.Various types of micro-organisms into the soil utilize these nitrogenousorganic residues for their metabolism.The resulting reaction yield a chain of intermediate products such as ammonia,nitrites and nitrates.Plants absorb nitratesand re-enter the nitrogen cycle.



Explain the classification of air pollution?

A.Classification of Air pollution:Air pollution can be categorised in two states. They are

Physical state 2)Chemical state

Physical state: Physical state air pollution can be categorised in two types,they are

Particulates ii)Gaseous containments

Particulates :The particulates include both solid and liquid particles.Small solidparticles and liquid droplets are collectively known as particulates. a)Suspended particulate matter:All solid and liquid particles in the air that are small enough not to settle out on to the earth surface under the influence ofgravity.

Respirable particulate matter: Particle of size less than 10 micrometer can enterinto the lungs.

Dust: Solid particles predominantly larger than those found in colloids ca-pable oftemporary suspension in air or other gases.

Aerosol: It is a suspension of solid and liquid particles having a negligiblefollowing velocity.

Smoke: Fine,solid particles resulting from in complete combustion of or-ganic substances such as wood,tobacco.

)Fume:Fine solid particles found by condensation of vapors of solid materi-als.

Gaseous containments:Pollutant that occur in gaseous state are called gaseouscontainment.

Inorganle gases:The gases include noxious gases pollutants like oxides ol nitrogen,oxides of sulphur,ammonia,chlorine,hydrogen,fluorine etc.

Organic gases:The gases include alcohol,organic acid,acetone vapours etc.

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2 Chemical state: Sulphur coniaining compound-SO:,SO,H.S.
Nitrogen containing compound-NO,NO,etc.Carbon containing compound -CO,CO,ete.Halogen compounds-HF,HCL ete.
Radio active compounds,the substances that are radio active air bome are called radioactive compounds
What are the ambient air quality standard?

are set by the Central Pollution Control Board(CPCB)that are applicable all over the country.
National Ambient Air Quality Standards are limits on atmospheric concentrationofsix po!luants that cause smog,acid rain,and other health hazards.Established by the United Siates Environmental Protection Agency under authority of the Clean Air Act NAAQS is applied for outdoor air throughout the country.
Air quality is measured with the Air Qualiy Index,or AQi.The AQI works like athermometer that runs from0to 500 degrees.However,instead of showing changesimthe tmperature,the AQlisaway of showing changes in the amount ofpollutionin the ar

Daily AQI Colour	Levels of Concern	Values ofInder	Description of Air Quality
Green	Good	0to 50	Air quality is satisfactory,and airpollution poses little or not risk
tellow	Moderate	51 to 100	Air quality is acceptable.However,there may be risk for some particularly those whoare unusually sensitive to air pollution
Orange	Unhealthy for sensitive Groups	101t0150	Members of sensitive groups may experi ence health effects.The general public isless likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects
Purple	Very Unhealthy	201 to 300	Health alert:The risk of health effects isincreased for everyone
Maroon	Hazardous	301 andhigher	Health warming of emergency conditions:everyone is more likely to be affected.

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UNIT -II

WATER POLLUTION

LONG ANSWER TYPE QUESTIONS

Define water pollution?Explain causes of water pollution?Give qualltyparameters of drinking water:

A.Water Pollution:Water pollution is defined as the contamination of water by foreign substances which make it harmful for health of animals or plants or aquatic life andmake it unfit for domestic,industrial and agricultural use.

Polluted water has a bad taste,oflensive odour,unpleasant weeds,uncheckedgrowth of weeds and oil or grease floating on the surface、

Major water pollutants:

Pollutant	Source
1.Micro organisms	Domestie sewage.
2.Organic wastes	Domestie sewage,animal waste,decaying animals and plants and discharge from food processing factories.
3.Plant nutrients	Chemical fertilizers.
4.Toxic heavy metals	Industries and chemical factories.
5.Sediments	Erosion of soil by agriculture and strip mining.
6.Pesticides	Chemicals used for killing insects,fungi and weeds.
7.Radio active substance	Mining of uranium containing minerals,use of radioactive substances isotopes in medical industrial and research applications.
8.Heat	Water used for cooling in industries.
9.Inorganic pollutant Poly phosphate	Detergents
10.Mineral acids	Coal mines
.11.01	Leakage from oil pipeline,tankers,ships.

Causes of water pollution:

)Pathogens :The most serious water pollutants are the disease causing agents called pathogens.Pathogens include bacteria and other organisms that enter water from domestic sewage and animal excreta.Human excreta contain bacteria such as Escherichia coli and Streptococcus faecalis which cause gastrointestinal diseases.

0)Organic wastes:The other major water pollutant is organic matter such as leaves,grass,trash etc.They pollute water as a consequence of run off.Excessive

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phytoplankton growth within water is also a cause of water pollution.These wastesare biodegradable.
The large population of bacteria decomposes organie matter present in water. They consume arygen dissolved in water.In cold water dissolved oxygen (DO)can reach a concentration upto 10 ppm.The organic matter when decomposes in
water can deplete the water of its dissolved oxygen in water.The concentration of
dissolved oxygen in water is very important for aquatic life.If the concentration of dissolved orygen of water is below 6ppm,the growth of fish gets inhibited.Oxygenreaches water either through atmosphere or from the process of photosynthesis carried out by many aquatic green plants during day light.However,during night, photosynthesis stops but the plants continue to respire,resulting in reduction of dissolved oxygen.The dissolved oxygen is also used by micro organisms to oxidise organic matter.
If too much of organic matter is added to water,all the available oxygen is used
up.This causes oxygen dependent aquatic life to die.Thus,anacrobic bacteria begin to break down the organic waste and produce chemicals that have a foul smell andare harmful to human health.Aerobic bacteria degrade these organic wastes and keep the water depleted in dissolved oxygen.
The amount of BOD in the water is a measure of the amount of organic material
in the watenclean water would have BOD value of less than 5 ppm where as highlypolluted water could have a BOD value of 17 ppm or more.
lii)Chemical pollutants: Water soluble inorganic chemicals that include heavymetals such as cadmium,mercury,nickel etc.,constitute an important class of pollutants.All these metals are dangerous to humans because our body cannot damagekidneys,central nervous system,liver etc.Acids from mines,drainage and salts from many different sources including raw salt used to melt snow and ice in the colder climates (sodium and calcium chloride)are water soluble chemical pollutants.
The organic chemicals are another group of substances that are found in pollutedwater.Petroleum products pollute many sources of water E.g.major oil spills in
oceans.Other organic substances with serious impacts are the pesticides that driftdown from sprays or run off from lands.Various industrial chemicals like polychlorinated biphenyls (PCBs)which are used as cleansing solvents,detergents andfertilizers add to the list of water pollutants.PCBs are suspected to be carcinogenic. Nowadays most of the detergents available are biodegradable.The bacteriaresponsible for degrading biodegradable detergents feed on these and grow rapidly. While growing,they may use up all the oxygen dissolved in water.The lack of oxygen kills all other forms of aquatic life such as fish and plants.Fertilizers containsphosphates as additives.The addition ofphosphates in water enhances algae growth.

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Such profuse growth of algac,covers the water surface and reduces the oxygenconcentration in water.

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Eutrophication; The process in which nutrient enriched water bodies support a dense plant population,which kills animal life by depriving it ofoxygen and results insubsequent loss of biodiversity is known as Eutrophication
It can support the abnormal growth of algae and thus the lakes and ponds becomemarshy.Due to the growth and decay ofalgae,the lakes get filled with sediment andultimately become dry.Due to eutrophication DO value in water decreases,it produces unpleasant odour,elogging ofpipes and interfere with fishing and navigation.
International standards for drinking water:
The international standards for drinking water are
)Fuoride (F-):For drinking purposes,water should be tested for fluoride ion concentration.Fluoride ions in water can be detected very easily with Zirconium-Alizarin-S-dye.Fluoride ions react with the dye to form zirconium fluoride whichis colourless.The colour of the dye becomes weak with the increase in the amountof fluoride ions.

Its deficiency in drinking water is harmful to man and causes diseases such astooth decay etc.Soluble fluoride is often added to drinking water to bring its concentration upto 1 ppm or 1 mg dm^3.The F-ions make the enamel on teeth much harder by converting hydroxyapatite [$3Ca_3(PO_4)$,Ca(OH),],the enamel on the surface ofthe teeth,into much harder fluorapatite However
F-jon concentration above 2 ppm causes brown motling ofteeth.When the fluorideion concentration in water is greater than 10 ppm causes Fluorosis.In fluorosis,thecolour of teeth tuns yellow,decay and weakness of bones in animals and human beings due to reaction of fluoride ions with calcium present in the body.In the districts of Nalgonda,Guntur and Prakasam in Andhrapradesh,the water contains excess of fluoride ions and it causes fluorosis.
Lead: Drinking water gets contaminated with lead when lead pipes are used fortransportation of water.The prescribed upper limit concentration of lead in drinkingwater is about 50 ppm.Lead can damage kidney,liver,reproductive system etc.
Sulphate :Excessive sulphate (>500 ppm)in drinking water causes laxative effect,otherwise at moderate levels it is harmless.

Nitrate:The maximum limit of nitrate in drinking water is 50 ppm.Excess nitrate in drinking water can cause disease such as methemoglobinemia (blue body syndrome)

Other metals:The maximum concentration of some common metals recommended in drinking water are ;

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Metals	Maximum concentration(ppm or mg dm^3)
Fe Mn Al Cu ZnCd	0.2 0.05 0.2 3.0 5.0 0.005

Higher amounts ofthese metals in water, causes toxic effect.

The maximum recommended levels of common metals and anions in drinking wvater are

Chemical Tolerable limit	Harms of higher concentration
1.Fluoride 1 ppm(1 mg dm^3)	Protects teethe against decay.High concentration(>10 ppm)are harmful to bones and teeth.
2.Lead 50 ppm(or 50 mg dm^3)	Damages kidneys,liver and branch
3.Sulphates 500 ppm	Higher concentration has laxative effect
4.Nitrates 50 ppm	Excess causes methemoglobinemid (blue baby syndrome)
5.O er me Zn=5 ppm Cu =3 ppm Fe=0.2 ppm Al=0.2 ppm Mn=0.05 ppm Cd=0.005 ppm	High concentration amounts have toxiceffect
6.pl 5.5-9.5	A decrease in pH increases the solubilityof metal ions

Define Hardness of water? Explain the methods that converts bottletemporary permanent water into soft water.

A Hardness of water: Water which does not give stable lather rapidly wih solution is caled hard water. The hardness of water is due to presence of calcium and magnesium bicarbonates, chloridesand sulphatesin it. The hardness ofwater istwo types () тетporary hardness (ii) pernanent hardness.

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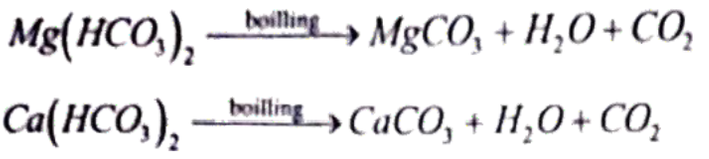
Temporary hardness of water:The presence of bicarbonates of caleium and magnesium causes temporary hardness to water

Methods for removal of temporary hardness :

By bollng:Temporary hardness can be removed by boiling hardwater.Onboiling hardwater,bicarbonates of calciumand magnesium decompose to forminsoluble carbonates ofthe respective method



Clark Process :Requisite quantity of milk of lime is added to the water sample to remove temporary hardness.Precaution should be taken to avoid excess of milk of lime because the water is ratify temporary hardness but acquires permanent hardness.

$Ca(HCO_3)_2+Ca(OH)_2\rightarrow 2CaCO_3+2H_2O$

$Mg(HCO_3)_2+Ca(OH)_2\rightarrow 2CaCO_3+Mg(OH)_2+2H_2O$

Permanent Hardness of water:The presence of chlorides and sulphates of calciumand magnesium as dissolved salts causes permanent hardness ofwater.

Methods for removal of permanent hardness:

lon exchange method:Suitable ion exchange resins have been developed to remove all mineral salts from water in the recent times.Thus "deionized water"isobtained.Thus water can be used for laboratory works and also in industry.The deionised water is carried out in two steps.

Step 1:Hard water is passed through a tank containing cation exchange resin which consists of giant organic molecules having COOH groups.The Ca^{2*},$Mg^{2*}$and any other cations present in the sample of water are replaced by H*ions from the resin

$2RCOOH + Ca^{2} \rightarrow R(COO),Ca+2H^{*}$

resin from hardwater absorbed on the resin

Step 2:Hard water is passed through a tank contain anion exchange resin whereanions in water are replaced by OH-ions from the resin.Anion exchange resinsare giant organic molecules with basic groups OH'attached to them.

$RNH;OH\sim+Cl\rightarrow R(NH_3)+Cl+OH\ RNH_3OH+SO\}\sim\rightarrow R(NH_3),*SO\}\sim+2OH$

$H'+OH\rightarrow H_2O$

step-1 step-2

released released

Deionised water can be used in place of distilled water

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Calgon Process: Calgon is sodium hexa meta phosphate.N *V3)6]*
or$[NaPO_3]_6$.This is not remove Ca^{2+}or Mg^{2+}ions from hard water by precipitateformation of Ca^{2+},Mg^{2+}.But they are removed from hard water by either adsorption or by forming a complex salt.Then the hardness of water is removed.

Disadvantages of hardwater:

1)Hard water used in boilers in industries causes formation of scales in the boilers.2)It causes waste of heat energy.

3)Hard water also causes wastage of soap.

Degree of hardness of water:The degree of hardness of water is defined as the number of parts by weight of calcium carbonate present in a million parts (ppm)by weight of water.

SHORT ANSWER TYPE QUESTIONS

Explain the terms COD and BOD?

A.Chemical oxygen demand (COD):

The amount of oxygen required to oxidise organic substances present in water is called Chemical oxygen demand (COD).

The oxidising agent used in the oxidation of organic substance in water is potassiumdichromate and 50%sulphuric acid.

If COD value increases,the water is said to be polluted.

Number of gram equivalents K_2CrzO_7=Number of gram equivalents of oxygenWeight of oxygen =Number of gram equivalents of oxygen x8

Biochemical oxygen demand (BOD):

The amount of oxygen used by the suitable micro organisms present in water during 5 days at 20°c is called Biochemical oxygen demand (BOD).

If BOD value increases,the water is said to be polluted.For pure water,BODvalue is about 1ppm.The municipal sewage water has BOD value is 100-400 ppm. BOD greater than 17 ppm is harrnful and highly polluted.

COD and BOD values determine the extent of pollution of water.

Write short note on dissolved oxygen

A. Dissolved oxygen(DO):The amount of oxygen present in water is called dissolved oxygen.In the dissolved state oxygen is the most important of the various substancespresent in water.Certain reducing substances use oxygen to get oxidised.The aquaticplants and animals also require oxygen for their existence.The amount of oxygen

$$BOD = \frac{\text{Weight of } O_2 \text{ required in mg}}{\text{Volume of water sample in litres}} = \frac{\text{Weight of } O_2 \text{ required in grams}}{\text{Million parts of sample}}$$

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required for healthy growth of plants and animals in water is 4-6 mg L'. If the amount of dissolved oxygen in water is reduced due to any reason the water is said to be polluted. On the basis of the DO value the extent af pollution is usually estimated.

The methods for controlling pollution are also evolved on the basis of DO. The methods are (1) winkler method (2) polarographic method (3) Membrane Electrode method.

Winkler Method: DO is allowed to react with r- to form Iz, ditrated with standard Na,S,O, solution addition of M,(I II) salt in strongly alkaline medium.

$MnO_2 + 2I^- + 4H^+ \rightarrow Mn^{2+} + I_2 + 2H_2O$

$I_2 + 2S_2O\}^- \rightarrow 2I^- + S_4O3^-$

5 ml of 0.025 M $Na_2S_2O_3$ = 1mgL¹ D.O.

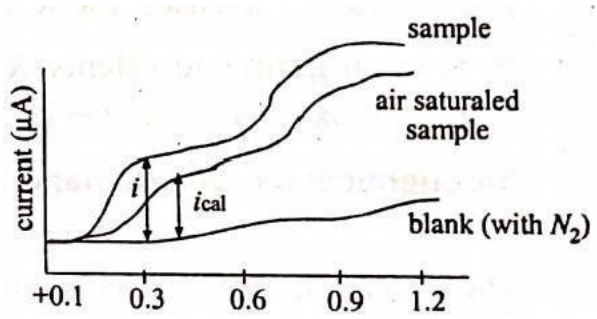
Polarographic Method: O_2 can be reduced at various electrodes in aqueous solution when a small -ve voltage is applied. The magnitude of current which flows is determined by the rate at which O_2 can diffuse to the electrode.

$$Mn^{2+} + \frac{1}{2}O_2 + 2OH^- \rightarrow MnO_2\downarrow + H_2O$$

Procedure: Transfer 10 ml of sample solution into the polarographic cell and added 0.1 ml of 1M KCl and small amount of Hg. Insert the DME with a head of 50 cm. of Hg and take readings of current at potential increasing from 0.1 to 1.5 volts. The height of the wave i for the sample solution is proportions to the level of D.O. Allow an air stream to double through the solution for 5 minutes, note the temperature and plot a second polarogram, the wave height igive the DO in air saturated water. Remove all D.O by bubbing N_2 for 10 minutes and plot again and measure is against the blank plot and obtain DO value from a calibration curve.

Potential (volts)

3. Membrane electrode method: The polarographic method is not desirable for analysis of DO in domestic or industrial waste waters as the Hg electrode gets poisoned by impurities in the test solution. This problem is solved by using the membrane electrode method. In this method two electrodes one of Ag and other one pb are immersed in a saturated $KHCO_3$ solution separated from the test solution by a polyethylene membrane. A galvanic cell can be plugged to a pH meter to give a direct reading of D.O in mg Ll scale the curent is measure for sample for a standard and for a blank solutions.



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$O_2+2H_2O+4e\sim\rightarrow 4OH\hat{}$(Ag clectrode) ph+4OH-$\rightarrow pbO_2+2H_2O+4e\sim$ 2pb+4OH^$\rightarrow$2pb(OH),+4e(ph electrode)

Define the terms Sink,Receptor and TLV.

A.Sink:The medium which reacts with pollutants is called sink.Example:Micro organisms which can eat the dead animals or which convert the dried leaves and garbage into fertilizers.Thus,the pollutant is removed by micro organism,similarly sea water is a big sink forCO_2.

Receptor:The medium which is effected by the pollutant is called receptor.Ex: When many vehicles stop at the traffic signal during peak hours,our eyes become red with burning sensation due to the smoke released from the automobiles.The eyes here are the receptors.

Threshold limit value (TLV):It indicates the permissible level of the pollutants or the toxic substances that can be present in a mine or in an industry.The,minimum lcvel of the toxic substances or pollutants present in the atmosphere which effects a person adversely when he is exposed to this for 7-8 hours in a dayis called threshold limit value (TLV).

Explain the physical and chemical properties of water.

A.Physical properties of water:Water is a colourless,tasteless and colourless liquid

Property	H_2O
Molecular Mass	18
Melting point (K)	273
Boilingpoint K	373·
Density at 293 K	1.0
temperature of max.density (K)	276.98
viscosity 293K	0.8903
specific heat	1.0
Dielectric constant (C^2|$N.m^2$)	82.0
Enthalpy of formation (KJ mol-l)	-285.9
Enthalpy of fusion (KJ mol-l)	6.01
Enthalpy of vapourisation at 393K	2258.9
Electrical conductivity at 293K	5.7×10~8
lonic product Kw at 293K	1×10~14
Solubility of NaCl	35.9

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Chemical Properties:

1.Stability:Water is a highly stable and dissociates to the extent of about 8.5%only at 2270°K,into $H_2$and O_2.

2)Amphoterie nature:H_2O act as a bronsted acid,when dissolving alkalies.Itact as a bronsted base when dissolved in acid.This is due to the autoprotolysis.

$H_2O+H_2O \rightarrow H_3O^{4}+OH$

Hydronium ion

So that water is amphoteric in nature.

Rcaction with non-metals:Halogens react with water under suitable conditions

$X_2 + H_2O \rightarrow 2HX + \frac{1}{2}O_2$ where X_2=F;or Cy_2.

Reaction with basic oxides:Strongly electropositive metals dissolve in water and form alkalies.

$Na_2O+H_2O \rightarrow 2NaOH$

Reaction with acidic oxides:Water react with non-metallic oxides to giveacids.

$SO_3+H_2O \rightarrow H_2SO_4$

5:Explain the water quality and criteria for finding of water qualityA.International standards for drinking water:

The international standards for drinking water are

Fluoride(F-):For drinking purposes,water should be tested for fluoride ion concentration.Fluoride ions in water can be detected very easily with Zirconium-Alizarin-S-dye.Fluoride ions react with the dye to form zirconium fluoride whichis colourless.The colour of the dye becomes weak with the increase in the amountof fluoride ions. Its deficiency in drinking water is harmful to man and causes diseases such astooth decay etc.Soluble fluoride is often added to drinking water to bring its concentration upto 1 ppm or 1 mg dm^3.The F-ions make the enamel on teeth much harder by converting hydroxyapatite [3Ca,(PO_4),Ca(OH),],the enamel onhe surfacc oftheteeth,into much harder fuorapatie($3Ca_3$(PO.),CaF3).However F~ion concentration above 2ppm causes brown mottling ofteeth.When the fluorideion concentration in water is greater than 10 ppm causes Fluorosis.In fluorosis,thecolour of teeth turns yellow,decay and weakness of bones in animals and humanbeinds due to reaction of fluoride ions with calcium present in the body.In the distriets of Nalgonda,Guntur and Prakasam in Andhrapradesh,the water containsexcess of fluoride ions and it causes fluorosis.

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Metals	Maximum concentration(ppm or mg dm^3)
Fe MnAl Cu ZnCd	0.2 0.05 0.2 3.0 5.0 0.005

Higher amounts of these metals in water,causes toxic effect.

The maximum recommended levels of common metals and anions in drinking water are

	Chemical Tolerable limit	Harms of higher concentration
	1.Fluoride 1 ppm(1 mg dm^3)	Protects teethe against decay.High concentration(>10 ppm)are harmful to bones and teeth
	2.Lead 50 ppm(or 50 mg dm^3)	Damages kidneys,liver and branch
	3.Sulphates 500 ppm	Higher concentration has laxative effect
	4.Nitrates 50 ppm	Excess causes methemoglobinemid (blue baby syndrome)
	5.O er me Zn=5 ppm Cu =3 ppm Fe=0.2 ppm Al=0.2 ppm Mn=0.05 ppm Cd=0.005 ppm 6.pl 5.5-9.5	High concentration amounts have toxic effect A decrease in pH increases the solubility of metalions.

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What is alkanity of water?How it is determined?

A.Alkanity of water:Alkanity is a laboratory measurement of acid neutralizing capability.It is the sum of all titratable bases down topH 4.5.It can experimentallybe found by determining how much acid it takes to lower the pH to 4.5.In neutralwaters,the most significant contributors to alkanity are the carbonate species,free

because most ncutral waters have a pH between 6 and 8.Alkanity can be estimatedby iis carbonate species alone at near neutral pH,most carbonates species are

bicarbonates.

Write short note on eutrophication?

A.Eutrophication:The phenomenon of a sudden increase in the organic and inorganic

nutrient supply in aquatic environment is referred to as Eutrophication.These nutrientsare basically nitrogen and phosphorous,and they favour overgrowth of algac andgrazing bacteria,then they results in oxygen depletion.

Phosphorus and nitrate dissolved in water act as nutrients and accelerate thegrowth of algae that may form a mat on the water surface.This increased productivityis called Eutrophication.

Types of Eutrophication:Eutrophication may be classified is two ways. 1)Natural Eutrophication:It is also termed as the natural aging of lakes or rivers.

It is a natural process and takes thousands of years.

Artificial Eutrophication:Organic pollutants from man's activities like effluentsfrom the industries and homes can radically accelerate the aging process.Thusthis phenomenon is also called anthropogenic or Man-made eutrophication.

Common causes of Eutrophication:

Agricultural Fields:Runoff from agricultural fields,urban lawns and similar sources may increase the flow of nutrients and organic substances into aquaticsystem.

Domestic Sewage:Domestic sewage is rich in nutrients,especially nitrogenand phosphorus,which cause eutrophication and nuisance algal blooms.Organicpollutants from sewage efluents over feed heterotrophic bacteria,depleting thedissolved oxygen (DO).

Industrial wastes:Phosphates are powerful stimulants for algal growth.Thus,the addition ofphosphates from detergents and fertilizers can lead to an algal bloom in which algae over grow the water surface.

Nitrogen from sewage effluents is another nutrient that can lead to algalblooms by relieving nitrogen limitation.

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Effects of Eutrophication:
Over growth of algae:Can interfere with the health and diversity of indigenousfish,plant and animal populations.
Algal Blooms:Can fully cover up the water surface and block sunlight,whichcauses the death of underwater plants and animals.When the algae die,thenwhose decomposition further depletes the water's dissolved oxygen content.
Some algal cells present in the algal blooms may also produce certain harmfultoxins and may cause certain diseases in human.Example,diarrhea, gastroenteritis,nauseactic.
Fish and other marine animals:Many die duc to depletion of dissolved oxygen.
This may lead to a decrease in aquatic biodiversity.
Control of Eutrophication:There are two ways of controlling Eutrophication or algal blooms.
Chemical Approach:The growth of algae can be inhibited by using algicidessuch as copper sulphate,sodium arsenate and 2-3 dichloro-naphthoquinonc.
Biological approach:Certain cyanophages (i.e.,the viruses that can kill algal cells)are also used to kill algal cells.
Explain about industrial waste water treatment.
] A.Industrial waste water treatment:The toxic and non-biodegradation chemicals in industrial waste effluent can be purified by three methods.They are 1)Filtration by activated charcoal,2)Synthetic organic ion exchange resin method,3)Membrane techniques.
Filtration by Activated charcoal:Activated charcoal with large surface areais quite an effective filter medium for adsorption of organic molecules.In this processmore than 99%reduction in the concentration of several chlorinated hydrocarbonsin an effluent stream.

Synthetic organic ion exchange resin method:These resins are very usefulor removal of industrial waste chemicals.Styrene -divinyl benzene copolymer can

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remove chlorinated pesticides by adsorption at the surface,while cationic and anionie exchange resins can eliminate ionic dyes from textile mill waste water.
Membrane techniques :The ion exchange membrane finds an important application in the removal of toxic wastes by ultrafiltration or reverse osmosis.In ulraitration the soluionis pushed under pressure througha membrane which containspores of size 21010,000 nm(20×10d)where by big molecules are retained and he efhuent that posses of is free of the big molecules.In the reverse osmosis the membrane pores are smaller-0.04 to 600 mm in size.Both these techniques have found extensive application in purification of industrial waste water in metal,textile, paper,pulp and food industries.

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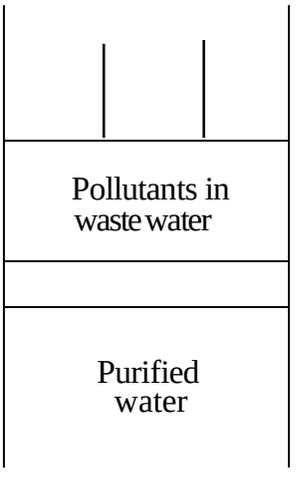

Lightning and rain

Membrane pore size
2-10,000 nm(ultrafilteration)
0.04-600 nm(reverse osmosis)

Explain TDS and TSS.
Total dissolved solids(TDS):Total dissolved solids represents the total concentration Of dissolvedsubstances in water.TDS is made up of organic matter common Inorganic salts that can be found in water.include calcium,magnesium,potassium and sodium which are all cations and carbonates,nitrates,bicarbonates,chlorides and sulfates which are all anions.Cations are positively charged and anions are negatively charged ions.Treatment for removal of TDS:Reverse osmosis process can use to remove the total dissolved solids in the water. Total suspended solids (TSS):Totalsuspended solid is a water quality parameter. It is the dry-weight of suspended particles that are not dissolved in a sample of water that can be trapped by a filter that is analyzed using a filtration operatus.

Write about sewage and sewage water treatment and treatment of municipalWaste water.
Domestic waste water treatment:Conventional sewage treatment plants are based Un biological decomposition of nontoxic organic wastes,using bacteria.Such Biological decompostion is conductedunder acrobic conditionsi.e,in the presence of plenty of oxygen.For oxidation of l¹mg ofcarbon,2.67 mg ofdissolved oxygen is required.Organic hydrogen sulphur and nitrogen the major elements in waste water consume additional oxygen for their oxidation.

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UNIT IV

CHEMICAL TOXICOLOGY

SHORT ANSWER TYPE QUESTIONS

Explain about the toxic chemical pollutants in the environment.

Chemical toxicology is the science of the study of toxic chemicals and their modes of action.There are a number of chemicals present in the environment.Some of these are toxic and the rest nontoxic.The toxic chemicals are discharged by industries into air,water and soil.They get into the human food chain from the environment. Once they enter our biological system they disturb the biochemical process,leading

in some cases to fatal results.The list of toxic chemicals is very long.These are Al. *Sb.As,Ba,Be,Bi,Cd,CO,Ce,In,pb.Hg.MO,Ag.Te,Sn,Ti,W U and Zn.*

The well-known toxic elements As,Pb and Cd are required in trace quantitiesfor the growth of animals.

Explain the biochemical effects of cyanide? [

Cyanide occurs in seeds of fruits such as apples,apricots,cherries,peaches and plums.Cyanide in plants is bounded to glycoside,called amygdalin and released byenzymatic or acidic hydrolysis.

Cyanide is used in various chemical synthesises in electroplating and metal-cleaning industries.Cyanide enters in the environment by many sources.HCN is employed as a füming agent to destroy rodents in grain bins,buildings and the holds of ships.

Cyanide poisoning can be treated by intravenous administration of $NaNO_2$or byinhalationof amylnitrate.

)NO oxidises haemoglobin HbFe(II)to methemoglobin,HbFe(III)which is

ineffective in carrying $O_2$to tissues.

The reaction accounts for the toxic effect of NO2 which results in oxygendeficiency and some times death.

词 HbFe()binds to CN~,there by releasing CN-from the cyanide complex offerri cytochrome oxide,Fe(III)oxide.

HbFe(H)+Fe(I)oxid-CN→HbFe(I)-CN+Fe(II)oxide

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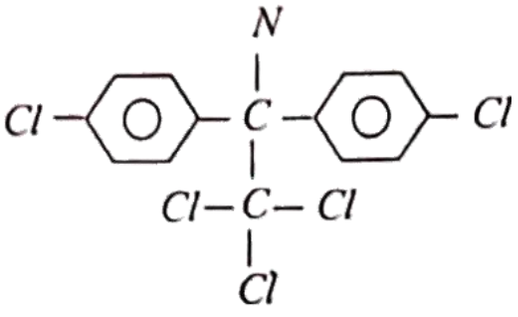
Explain the biochemical effects of Pesticides?

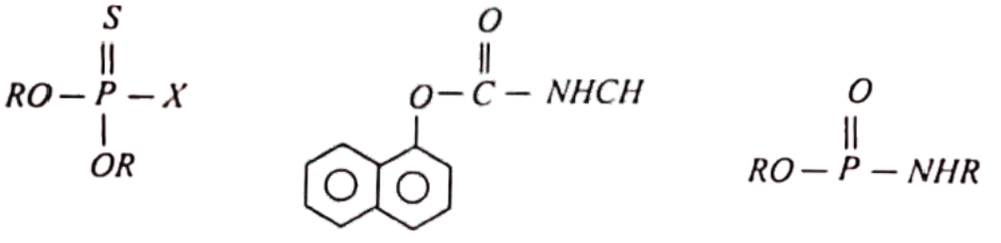
A. From the viewpoint of public health the biochemistry of pesticides is considerable significance. Biochemical processes constitute the major mechanism by which pesticides in the environment are degraded and detoxified. Among the pesticides, the biological action of DDT on the environment has been most extensively studied. The central nervous system is the target of DDT like many other insecticides.



DDT

DDT dissolves in fat tissue and accumulate in the fatty membrane surrounding nerve cells. This is likely to lead to interference with the transmission of nerve cells. The net result is disruption of the central nervous system killing the target insect.

Organo phosphates and carbonates degrade quite rapidly in the environment.



Denitriting OrganoPhosphates

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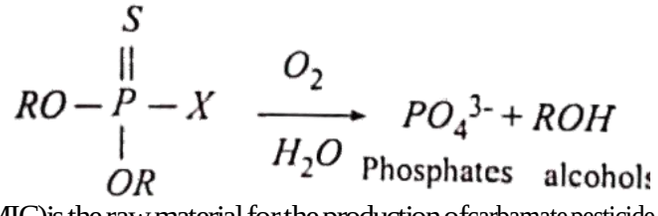
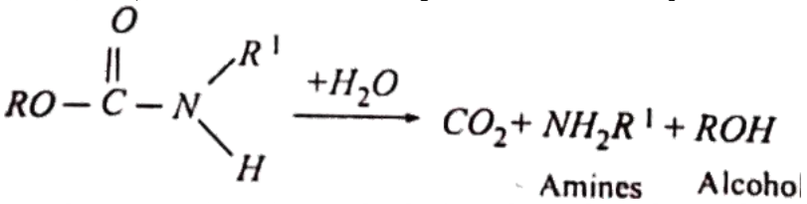
The organo phosphates and carbamates react with O_2 and H_2O undergoing decomposition within a few days in the environment the products are nontoxic.



Phosphates alcohols

Methyl Isocyanate (CH,NCO,MIC) is the raw material for the production of carbamate pesticide. MIC is a volatile liquid and extremely



Amines Alcoho

hygroscopic therefore it 1s stored in moisture free refrigerated tanks. According to the findings of the world died in organisation 75,000 people are poisoned by pesticides and 14,000 people are died in every year

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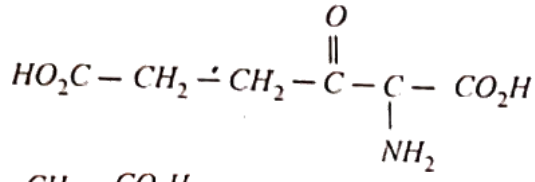
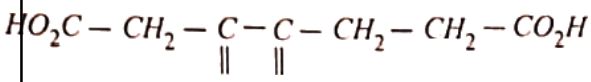
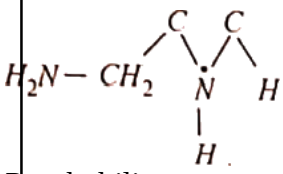
Explain the Toxicity of lead.

A.Leadisarelatvely abundant metalin nature occuring in lead minerals thaneheavy metas.The majorbiochemieal elfecto[pЬ15 15imterlerence'wuuheme synlesisleadsto hematologicaldamage.Leadinhbis severalofthekeyenzymes: пуоГуедйпШе оуегаПргосезз оГпетс бутПеяв Ьуте теиаЬоПс теттешаез accumulate.The intermediale isdela-aminolevuime acid. in'1hs syntnesis the conversion ofdela-aminolevulnicacidloporphobiinogenisanvmiporuitphase.

Delta-aminolevulinic acid







Porphobilinogcn

The efect oflead is the disrupton ofthe synthesis of haemoglobin as well as other respiratory pigments like cytochromes. Pb does not permit utiization of O, and glucose for life-sustaining energy production.Athigherlevel ofPb in the blood,it is a symptom of anaemia due to the deficiency ofhaemoglobin.

Б. Explain biochemical effect of Mercury.

A. The natural abundance of Hg in soil is 0.1 parts per milion. In nature Hg occurs as a trace component of many minerals, continental rocks containing an average of about 80 parts per billion.The principal ore is cinnabar.

Hg enters in the environment mainly through human activities. Once Hg is absorbed on sediments of water bodies and streams, it is slowly released into the water and constitutes a reservoir which is likelyto cause chronic pollution, longafterte original source of Hg is removed.

The toxicity ofHg depends on its chemicalspecies like Hg. Нв2*, Нд2*,RHg*,R,Hg and HgS.

Elemental Hg is fairly inert and non-toxic. Hg_2^{2+}contain high concentration ofchonide andlowtoxic. Нв2* 1s fairly toxic it contains high affnitysulphur atoms. RHg* (CH,Нв* metnyl rercury) is the most toxic species. lt 15 soluble in lipid (fat).The covalent Hg — Cbond is not easily disrupledand the alkylmercury is retainedin cells for prolongedperiods oftime. h Minamata lncident, Mercury isa wel known toxic metal. In 1953 to 1960 at minamata bay in Japan more than 100 peoplelost their lives and many thousands ofpeople were permanenly paralsed from eatng mercury contaminated ish.

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Explain carbon biochemical cycle.

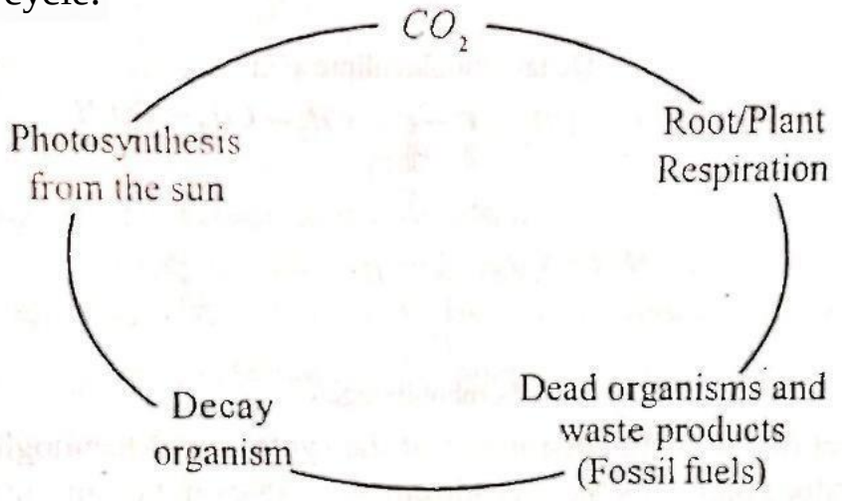
Carbonbiochemicalcycle:Carboncycleisa gaseous cycle.Carbon circulate in the form of CO,between Biotic and Abiotic.The Main reservoirs ofcarbon elementis sea water,atmosphere (CO_2),Rock (limestone and coal),soil,in living being (protein,carbohydrates,fats,nucleic acid and vitamins),animals with endoskeleton &exoskeleton,elements/pure form ofcarbon (Diamond and Graphite), hydro carbonated salts in various minerals.

The largest reservoir of carbon is sedimentlary rock such as limestone.

The oceans are,by far,the largest reservoir of carbon,followed by geologicalreserves of fossil fuels (coal,petroleum,natural gas,tar sands,crude oils)

Plants (proteins

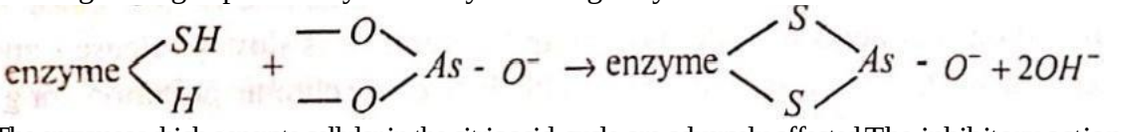
cycle:



1.Photo synthesis -CO,taken2.Respiration-CO_2given out

How is Arsenic poisonous?Explain [SKU 19;YVU 19]

A.Biochemical effects of Arsenic:Arsenic commonly occurs in insecticides, fungicides and herbicides.Among its compounds,those of As(III)are the mosttoxic.As(IID)exerts its toxic action by attacking of SH group ofan enzyme therebyinhibiting enzyme action.



The enzymes which generate cellular in the citric acid cycle are adversely affected.The inhibitory action is based on inactivation of pyruvate dehydrogenase by complexation with As(III)whereby the generation ofATP is prevented.

An important step in ATP generation is the enzymatic synthesis of 1,3-diphospoglycerate from glyceraldchyde 3-phosphate.Arsenate interferes bypruducing l-areseno-3-phosphoglycerate instead of 1,3 -diphosphoglycerate.

Phosphorylation is replaced by arsenolysis which consists of spontaneous hydrolysis to 3-phosphoglycerate and arsenate.

The three major biochemical actions of Arsenic are coagulation ofproteins,complexation with coenzymes and uncoupling ofphosphorylation.

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Explain the biochemical effect of Cadmium.

A. Biochemical effects of Cadmium: The outbreak of Cd poisoning occurred in Japan in the form of "ouch ouch" disease. Many people suffered from this disease.

Ai high level Cd causes kidney problems, anacmia, bones becomes fragile and bone marrow disorders

The major portion of Cd ingested into our body is trapped in the kidney and eliminated. A small fraction is bound most effectively by the body proteins, metallothionein, present in the kidneys, while the rest is stored in the body and gradually accumulates with age. When excessive amounts of Ca- are ingested it was replaced by zn^{2+} at key enzymatic sites causing metabolic disorders

Solid waste management: Solid material arising from human activities and discarded as useless is called solid waste.

Causes: Garbage, Rubbish, Pathological waste, Industrial waste, Agricultural waste.

Carbaryl

Collection devices: Garbage grinders,, pnumatic pipes, transfer stations.

Disposal Methods: Open dumps and stationary land fills.

Volume reduction prior to disposal:

Incineration-Complete burning ii) Shredding-Cutting into small pieces

Pyrolysis: Combustion in absence of oxygen

Recovery : Utilizing residues of solid. Waste management as raw materials.

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UNIT V ECOSYSTEM AND BIODIVERSITY

LONG ANSWER TYPE QUESTIONS

What are the current trends in biodiversity. A.Recent and current trends in biodiversity:

Across the range of biodiversity measures,current rates of change and.loss exceed those of the historical past by several orders of magnitude and show noindication of slowing.

Virtually all of earths ecosystems have now been dramatically transformed throughhuman actions.

Habitat conversion to agricultural use has affected all biogeographical realms.

The majority of biomes have been greatly modified between 20%and 50%of9out of 14 global biomes have been transformed to croplands.

Rates of human conversion among biomass have remained similar over atleastthe last century.

Over the past few hundred years,humans have increased the species extinctionrate by as much as three orders of magnitude (medium certainty)

Between 12%and 52%ofspecies within well-studied higher taxa are threatenedwith extinction,according to the IUCN Red list.

Threatened vertebrated are mot numerous in the biomes with intermediate levelsof habitant conversion.

Among a range of higher taxa,the majority of species are currently decline.

Genetic diversity had declined globally particularly among domesticated species.11.Globally,the net rate of conversion of some ecosystems has began to slow,and

in some regions ecosystems are returning to more natural states largely due to reductions in the rate of expansion of cultivated land,though in same instances such trends reflects the fact that little habitants remains for further conversion.

Translating biodiversity loss between different measures in not simple rates of change in one biodiversity measure may underestimate or over estimate rates ofchange in another.

Biotic homogenigation,defined as the process where by species assemblages become increasingly dominated by a small number of wide spread species represents further losses in biodiversity that are often missed when onlyconsideringchanges in absolute numbers of species.

4.

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Nitrogen cycle

fogen eyele the mos important and crucial biogecochemical cycle oftheenvionnent.NMirogen esissin Orgnic and inoreamicfle conpound.It andergoncavionmncnt Nirogenacs.it is highly interchangeable compound.It undergoes transformations form onc oxidation state to another oxidationsteat nicopen tiktobheuse oforganisms.Dinitrogen is made biologically available through nitrogen fixation. 1)The nitrogenase enzyme present in the nitrogen fixers catalyzes the reduction of $N_2$to NH_3(ammonia)

$N_2+8H^{\wedge}+8e\sim\longrightarrow 2NH_3+H_2\cdot$

Ammonia Oxidizing bacteria are autotrophic and involve two enzymes Via,ammonia Mono oxygenase and hydroxylamine oxidoreductase.

$NH_3+O_2+2e\rightarrow NH_2OH+H_2O\ NH_2OH+H_2O\rightarrow NO_2+5H++4e$

$2NO_3+10e\sim+12H^4\rightarrow N_2+6H_2O$

Plants take up nitrogefas ammonium(NH:)and nitrate (NO5)ion from soil mixture.Ammonia is toxic at higher concentration and hence used less by the plants.

$$NO_2+\frac{1}{2}O_2\rightarrow NO_3$$

Nitrogen enters into the animals and and other trophic levels ofthe food chain viathe plants the waste generated by the animals,death and decay ofplants and animals results in the generation of inorganic nitrogen via decomposition process.

The decomposers convertthe ammonia(NH_3)into ammonium(NH()iscalled ammonification.Bacteria,actinomycetes and fungi play an important role as decomposers.Ammonium is then available for plants and other micro organisms for growth.

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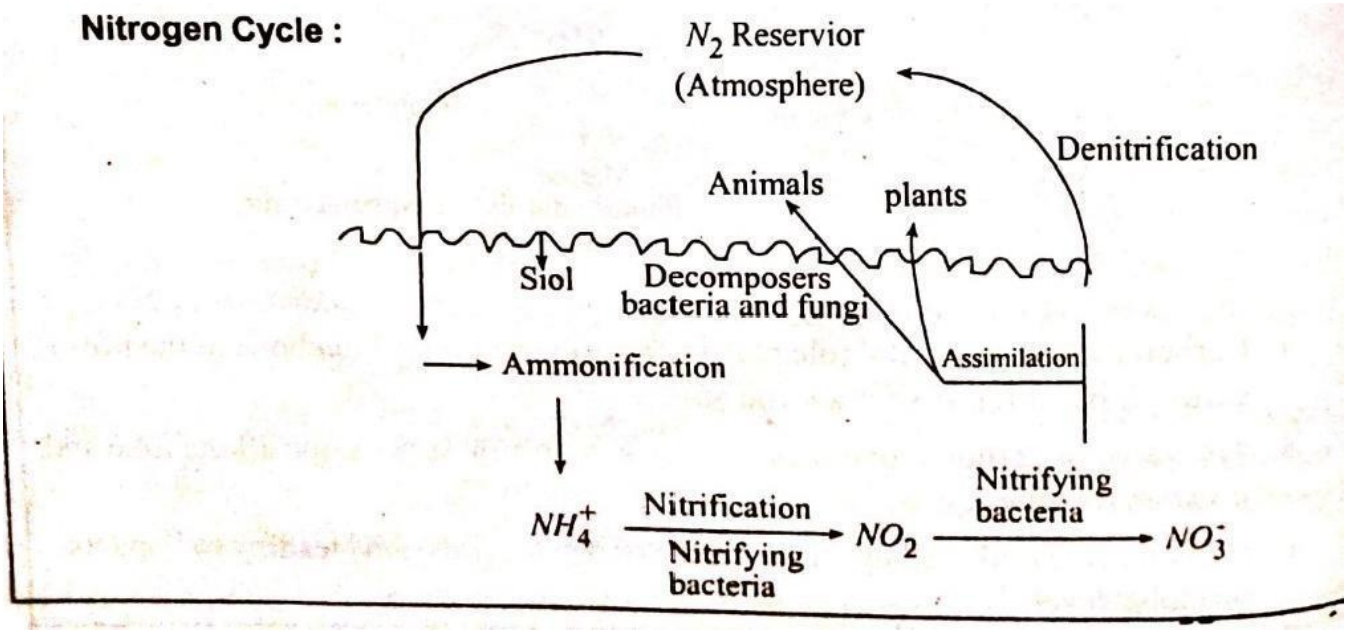
Nitrogen Cycle :



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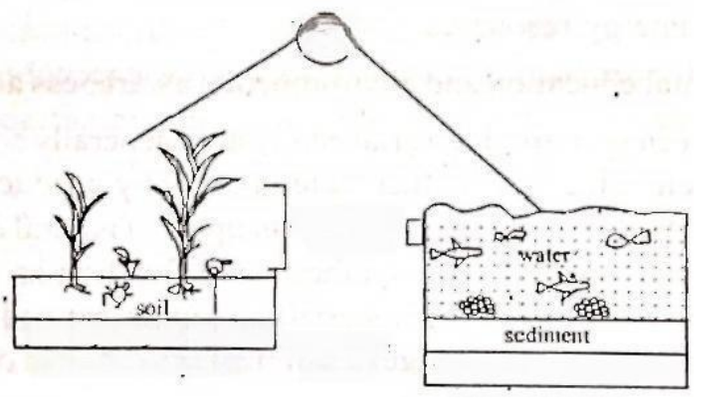
Impact of human activities on nitrogen cycle:

The NO_2which is produced as an intermediate during the denitrification is a green house gas and posses more global warming potential than methane and carbondioxide.
Combustion of fuel at high temperature releases a huge amount of NO of the atmosphere which later gets converted to NO,and HNO,in the atmosphere.
The HNO_3reaches the earth as acid rain and causcs cnvironmental and health effects.
Nitrate is readily soluble in water and leaches out into the water bodics.Excessiveuse of nitrate in fertilizers can contaminate ground and surface water which is harmful for the health of an individual especially the infants.
SHORT ANSWER TYPE QUESTIONS
Define and explain ecosystem?
A. Definition of ecosystem:Any small change in environment,the change has an effect onthe living organisms and vice-versa is known as ecosystem.
Explanation :The word "Ecology"was introduced by a German biologist in 1869 derived from the Greek word.Ecoloby is the branch of science,which deals with the study of interactions between living organisms and their physical environment.The ecosystem is the functional unit in ecology it consists of both biotic communityand abiotic environment.The interaction is conducted by energy flow (solar energy)in the system and cycling of materials.
Grass land and pond ecosystem
Ecosystem of the world are studied on the basis of their principal habitates.The



ecosystem may be
1 land based ecosystemi)Marine ecosystem in)Freshwater ecosystemiv)Wetland ecosystem
v)Mangroves ecosystem

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Define and explain the types of ecosystem?
[

Ecosystem :Asmall change in environment the change has an effeet on the living organisms and vice-versa is known as ecosystem.Eeosystems are elassified into three types.They are
Forest ecosystem il)Sustainable ecosystemiii)Industrial ecosystem
Forest ecosystem:The dynamie balance is among plants (producers),bacteriaand Micro-organisms (decomposers)and animals plus man(consumers).Onee thisdynamic balance is upset there is ecological crisis and the entire biosphere is in danger.
Forests are renewable resources and have a key role in improving the quality of environment by exerting beneficial eftect on the life support system.Forests contributethe economic development.
H)Sustainable ecosystem:The developing countries face today critical situation on economic and environmental fronts for economie growth they have to give priorityto agricultural industrial bases but at the cost of environment.
The main components of sustainable development ecosystem are1.Stabilisation ofpopulation
2.Integrated land use planning 3.Conservation of biodiversity 4.Controlling of water air pollution
5.Renewable energy resources
6.Environmental education and environmental awareness at all levels.
III.Industrial eco system:Industrial eco system generally constitute more numberof groups.Which utilizes each other materials and by-products so that waste is at aminimum.Industrial ecology follows the principles of natural ecosystems,which aredriven by solar energy and photosynthesis and function as a system of mutually interacting organisms,where by materials are interchanged in cycles.Inorder to ensure maximum efficiency cycligation of materials should occur to the maximum extent.
The important components of industrial ecosystem are
Primary materials producer 2.Source or sources of energy
Materials manufacturing and processing sector
Waste producing sector5.Consumer sector

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Deine and explainthe types of ecosystem?

A.

organisms and vice-versa is known as ccosystem.Ecosystems are classified intothree types.They are Forest ecosystem ii)Sustainable ecosystemii)Industrial ecosystem

Forest ecosystem:The dynamic balance is among plants (producers),bacteria and Micro-organisms (decomposers)and animals plus man (consumers).Once this dynamic balance is upset there is ecological crisis and the entire biosphere is in danger.

Forests are renewable resources and have a key role in improving the quality ofenvironment by exerting beneficial effect on the life support system.Forests contribute the economic development.

I)Sustainable ecosystem:The developing countries face today critical situation on economic and environmental fronts for economic growth they have to give priorityto agricultural industrial bases but at the cost of environment. The main components of sustainable development ecosystem are1.Stabilisation of population

2.Integrated land use planning3.Conservation of biodiversity

Controlling of water air pollution5.Renewable energy resources

6.Environmental education and environmental awareness at all levels.

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The important components of industrial ecosystem are1.Primary materials producer

Source or sources of energy

Materials manufacturing and processing sector4.Waste producing sector

5.Consumer sector

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Dolne Mote and ahiots components?

A. The cowtem is a tuncdonal umt of ecology and it comists of two componentThex ae o Miatie communty i)Abiotie environment

Biote cammunty:A hiote community is nothing but all the living organisms which tunetion together,It means the living organtsms of the environment plants,ammals,

hunan beimgs and micre organsm.

Ablетie envlronment:The ahiotie environment have close interaction,essential for

mainenawe of lfe pvocess.The interaction is done by energy fow(solar energy) in the svstem and eyelmg of materials(natural eycles), It means the non-living part of theenvironmentsai,water,sorl and minerals.The climatie factors or physical tactos such as sunlght,temperature,rain fall,wind and pressure are a part of ahiotic environment,

A Kxplain the energy fow dynamlew of ecosystem?

A.E neroy dynamles in an ecosystem :Almost all life on this planet is powered either direely or indirectly by sunlight.Energy captured from sunlight drives the production of energy-rich organie compounds during the proceed of photosynthesis,These wganiecompounds are the biomass of the ecosystem the biomass is equivalent to the net primary productivity,which is the amount of energy eaptured and stored by the producers,This is also the amount of energy available to the next trophie level, The net primary produetivity is derived from the gross primary productivity,Which is a measure of the total amount of light energy that was captured and converted into chemical energy during the photosynthesis.

In terrestrial system,plants play the role of producers.Plants allocate the biomass topower(energy)their life processes or to store energy,Different plants have different strategies of energy allocation that refleet their role in various ecosystems. As plants the producers are consumed or decomposed,and their stored chemical energypowers additional individuals,the consumers,or tropic levels of the biotiecommunity.Biotie systems run on energy much as economie system run on money,Energy is generally in limited supply in most communities,Energy dynamies in a biotie community is fundamental to understanding ecological interactions.

Write down brlefly on food chaln and foodweb In ecosystem?

|A.Food chaln in ecosystem ;A food chatn in an ccosystem is a series of organisms in whicheach organism feeds on the one below it in the series,is ealled food chain.

In ecosystem the ultimate source of the energy is the sun,Producers like green

plants trap solar energy is converted in to chemieal energy of food.The primaryconsumer is then caten by a secondary eonsumer and the secondary consumer may

be eaten by a tertiary consumer and soon.In this way energy gets transferred from oneconsumer to the next higher level consumer.A series through which food energy

flows in an ccosystem is called a food chain.

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A food chain in a grass land ecosysterh may consists of grasses ana ouietgrasshoppers,frogs,snakes and hawks. Sunlight→grass →Grasshoppcr →Frog→Snake →Hawk.A food chain always begins with producers.

Discuss about tropic levels of ecosystem?

A. The number of steps an organism,is from the start of the chain is a measure of itstropic level.Food chains start at tropic level 1 with primary producers such as plants
move to herbivores at level 2 predators at level 3 and typically finish with carnivoresat level 4 or 5.
Most primary producers get their energy directly from the sun.Primary producers
are important to the whole food chain because they are the original source of energy that is then passed between other organisms the third tropic level contains organismscalled secondary consumers.

Define Biodiversity?Explain level and types of biodiversity?

A.Definition: Biological diversity means the variability among living organisms fromall sources including inter alia,terrestrial,marine and other aquatic ecosystems andthe ecological complexes of which they are a part.This includes diversity within species,between the species and ecosystems.The different varieties and types ofanimals and plants live in the ocean is an example ofbiodiversity.

Level and types of biodiversity:Biodiversity is usually explored at three levels. Theyare
Genetic diversity
Species diversity 3.Ecosystem diversity

Genetic diversity:It is the variety of genes with in species,each species is made up of individuals that have their own particular genetic composition.This meansa species may have different populations,each having different genetic compositions.

Species diversity:It is the number of different species that are represented in a given community.The effective number of species refers to the number of equallyabounded species needed to obtain the same mean proportional species abundanceas that observed in community.Species diversity consists of three components.
They are
i)Species richness,ii)Taxonomic,iii)Species evenness.

Species richness is a simple count of species,taxonomic is the genetic relationshipbetween different groups of species and species evenness the relative abundance
of different species.

Ecosystem diversity:Ecosystem diversity deals with the variation in ecosystemswith in a geographical location and its overall impact on human existence and the
environment.

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Explain the concept of biodiversity.

Concept: All life forms that make up biodiversity,including humans are ultimatelyconnected to all other life forms and to their physical environment.No one livingelement of any ecosystem ean survive independent of the otners.Connections among living and non-living elements keep the environment functioning and healthy.Becausebiodiversity represents the inter connectedness of all things.The effect of some causes can be surprising.Human impact on the environment therefore directly orindirectly eflects the function of other living things and by extension ourselves.

Explain significance and magnitude of biodiversity.

A.Significance of biodiversity:

Bio diversity is very important for human life,as we depend on plants,micro-organisms earth's animals for our food,medicine and industrial products.

Biodiversity protects the fresh air,clean water and productive land.

It is also important for forestry,fisheries and agriculture,which depends on richvariety of various biological resources available in nature.

Loss of biodiversity has serious economic and social costs for any country.

Write about distribution of biodiversity?

A. The distribution of species around the globe is not random.There are some generalprinciples that will help make sense of species diversity trends.It is important to understand the distribution of species on the planet for many reasons.

Distribution ofbiodiversityi.Latitudinal gradient

ii.Hypothesis for latitudinal gradient

i Geological and Evolutionary Historyiv.Productivity

Stability

More niches

vi.Piggy banking of speciesvi.The cfopping principle

Write about the ecological crises and equilibrium?

A. Ecological crises:The main causes of environmental crises are water pollution, resourcescrises,gender imbalance,population,land pollution,urban sprawling, deforestationand over production,

The major environmental problems are ozone depletion,green house effect,and

global warming.Desertification,Deforestation,loss of biodiversity and disposal ofwastes.

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Prevent environmental crises:Implementing recycling habits into your aaiy lite is the one of the most effective ways to help lesson land fill waste.Conserve natural resources,save habitats reduce pollution,cut down on energy consumptionand slow down global warming.

Write short note on biogeographical classification of India.

A.Biogeographical classlfication in India:Biogcography is the study of distribution of species,organisms and ecosystems in geographic space and through geological time.India has very typical geology,terrain conditions,tropography,land use,geographic and climatic factors.Based on these factors the country can be divided into ten recognizable biogeographic zones.

1)Trans -Himalayan region	2)Himalayan zone
3)Indian desert zone	4)Semi-arid region
5)Western ghats	6)Deccan plateau
7)Gangetic plains	8)Coastal regions
9)North -East region	10)Andaman and Nicobar Islands

Discuss about Biodiversity-In-situ conservation.

A.Conservation of Biodiversity:Conservation involves protection,preservation and management of Biodiversity.Conservation means management of man's use ofBiosphere in such way that maximum benefit is attained by the present generation while maintaining its potential to meet the requirement of future generation.

Deriving maximum advantage without degrading it.

Methods of conservation of Biodiversity

In-situ conservation:Insitu conservation in their natural habitate protection throughnetwork of protected areas.Less expensive and easy to manage without human interference protect intensis of Indigenous people.

National parks: The area strictly reserved for betterment of wild life and where activity like forest grazing are circumscribe these are small areas like 100 sq.km to 500 sq.km.These parks are maintained by National Government.103 national parks in India.First National park of India is Jim Corbett(1936).

Wild life sanctuaries :Protected area which is reserved for conservation of animals.Human activities like harvesting of timber are allowed as long as they do not interfere with well being of animals.Boundaries not well defined.Controlled biofic interference permitted -tourist activity.544 sanctuaries are there in India.

Biosphere reserves :Protected areas where human population also forms a part of this system.Concept evolved by UNESCO's Man And Biosphere Program (MABP).18 Biosphere reserves their in India.

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4 Saered grooves and lakes:Sacred forest patches around places of worship. Hteld in high esteem tnbal communities and govemment they are most undisturhed forest patches,Anexample for sacred grooves is Khashi hills of Meghalaya.Tribes have built temples in such patches and donot allow to cut even single branch of tree. Therefore endemie species flourish here.An example for waterbodies is lake Mansar in Jammu and Kashmir.

Ex-situ conservation:It is outside their natural habitate,endangered animals on verge of extinction are suceessfully breaded.Useful for conducting research observing wild animals,

Write the importance features of wild life protection act.[SKu 19,γvu 18]

A.Features of wild life protectlon act ;

wild life :All animals and plants which are not domesticated is called wild life. This act was created in 1972 for the sake of protection for India's wild life both terrestrial and aquatic and further habitates.It consists of 60 sections and 6 schedules which was divided into 8 chapters.It came into force on 9*September 1972.Itextends all the states in India except Jammu and Kashmir

Features

Authorities constituted: Central Govemment appoints director,assistant director for wild life preservation.State government and administrators of Unionterritories constitutes wild life board.

Duties of wild life advisory board:They select some areas to be declared as sanctuaries and national parks.Policies are formed for protection and conservation of wild life and specified plants.Measures to be taken forharmonising the needs of the tribals.

Hunting of wild animals:Hunting means capturing,killing,poisoning,trapping of any wild animal and injure,destroy,taking away any part of the body,damaging eggs,nests and disturbing them.The specified point in this act prohibit hunting of any wild animals.

Hunting of wild animals to be permitted under certain cases:Any wild animal specified,that has become dangerous to human life or is so disabled ordiseased as to be beyond recovery.Hunting is permitted for education and

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5.Write note on tropic levels.

Tropic levels:The various links or steps in a food chain at which the transfer of food and energy takes place are called tropic levels.The producers are at the first tropic level as they manufacture food.The primary consumer from the second tropic level,the secondary consumers the third,and the tertiary consumers from the ourth tropic level.

E.g.Grass is the producer which is eaten by the caterpillar known as primary consumer,then the caterpillar is caten by frog,secondary consumer and the frog eaten by snake,tertiary consumer which is finally eaten up by owl which is a quaternary consumer.

Write about value of 'Z'in region and continent?

A.The value ofZ is studied,it comes equalto 1.15 for fruit eating birds and mammals of tropical forests of different continents.

A continent is one ofthe several very large landmasses.Generally identifiedby convention rather than any strict criteria.Up to seven regions are commonly regarded as continents,ordered from largest in area to smallest,they are Asia, Africa,North America,South America,Antarctica,Europe and Australia.

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