

# Environment and Sustainability (4300003) - Winter 2021 Solution

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## Question 1 [ marks]

14 Answer any seven questions.

0.0.1 1. Define the terms: 'Ecology' and 'Ecosystem'.

### Solution

**Definitions:** **Ecology** is the scientific study of relationships between living organisms and their environment. **Ecosystem** is a biological community of interacting organisms and their physical environment functioning as a unit.

**Table 1.** Terms and Definitions

Term	Definition	Example
<b>Ecology</b>	Study of organism-environment relationships	Forest ecology
<b>Ecosystem</b>	Living and non-living components interaction	Pond ecosystem

- **Biotic components:** Living organisms in the system
- **Abiotic components:** Non-living factors like air, water, soil

### Mnemonic

Every Component Lives Together (Ecology Creates Living Together)

0.0.2 2. Define the terms: 'Pollution' and 'Pollutant'.

### Solution

**Definitions:** **Pollution** is the introduction of harmful substances into the environment causing adverse effects. **Pollutant** is any substance that causes pollution when present in excessive amounts.

**Table 2.** Pollution Terms

Term	Definition	Types
<b>Pollution</b>	Environmental contamination	Air, Water, Soil, Noise
<b>Pollutant</b>	Harmful substance	Physical, Chemical, Biological

- **Primary pollutants:** Directly emitted substances
- **Secondary pollutants:** Formed by reactions in atmosphere

**Mnemonic**

Pollution Produces Problems (Pollutants Produce Problems)

**0.0.3 3. What is noise pollution? What is unit of intensity of sound?****Solution**

**Noise pollution** is unwanted or excessive sound that disrupts human activities and harms living beings. The unit of sound intensity is **decibel (dB)**.

**Table 3.** Sound Levels

Sound Level	Source	Effect
30-40 dB	Library	Comfortable
60-70 dB	Traffic	Annoying
90+ dB	Industry	Harmful

- Threshold of hearing: 0 dB
- Threshold of pain: 120 dB

**Mnemonic**

Decibels Determine Damage (dB Determines Damage)

**0.0.4 4. What is solid waste management? Give its objectives.****Solution**

**Solid waste management** is systematic handling of waste from generation to final disposal to minimize environmental impact and protect public health.

**Objectives:**

- **Public health protection:** Prevent disease transmission
- **Environmental protection:** Reduce pollution and contamination
- **Resource recovery:** Recycle and reuse materials
- **Cost effectiveness:** Economic waste handling

**Mnemonic**

People Expect Resource Conservation (Protection, Environment, Resource, Cost)

**0.0.5 5. Enlist types of solar cells.****Solution**

Solar cells convert sunlight directly into electricity through photovoltaic effect.

**Table 4.** Types of Solar Cells

Type	Efficiency	Cost	Application
Monocrystalline	15-20%	High	Residential
Polycrystalline	13-16%	Medium	Commercial
Thin Film	7-13%	Low	Large scale

- **Silicon-based:** Most common type
- **Non-silicon:** Emerging technologies

#### Mnemonic

Most People Think (Mono, Poly, Thin-film)

### 0.0.6 6. What is climate change?

#### Solution

**Climate change** refers to long-term shifts in global temperatures and weather patterns, primarily caused by human activities and greenhouse gas emissions.

##### Causes:

- **Greenhouse gases:** CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O emissions
- **Deforestation:** Reduced carbon absorption
- **Industrial activities:** Fossil fuel burning

##### Effects:

- **Rising temperatures:** Global warming
- **Sea level rise:** Melting ice caps

#### Mnemonic

Change Creates Consequences (Climate Change Creates Consequences)

### 0.0.7 7. What is C.F.C?

#### Solution

**CFC (Chlorofluorocarbon)** are synthetic compounds containing carbon, fluorine, and chlorine atoms, previously used in refrigeration and aerosols.

##### Properties:

- **Ozone depleting:** Destroys stratospheric ozone
- **Greenhouse gas:** Contributes to global warming
- **Stable compounds:** Long atmospheric lifetime
- **Montreal Protocol:** International ban agreement

#### Mnemonic

Chlorine Fluorine Carbon (CFC components)

### 0.0.8 8. Give advantages of ISO-14000.

#### Solution

**ISO 14000** is international standard for environmental management systems.

##### Advantages:

- **Environmental compliance:** Meet legal requirements
- **Cost reduction:** Efficient resource use
- **Market advantage:** Enhanced company image
- **Risk management:** Prevent environmental incidents

**Table 5.** ISO-14000 Benefits

Benefit	Impact	Result
<b>Compliance</b>	Legal safety	Avoid penalties
<b>Efficiency</b>	Resource saving	Cost reduction
<b>Image</b>	Market position	Competitive advantage

#### Mnemonic

Companies Gain Market Recognition (Compliance, Cost, Market, Risk)

### 0.0.9 9. Enlist various Acts related to environment in India.

#### Solution

India has comprehensive environmental legislation framework.

##### Major Acts:

- **Air Act (1981):** Air pollution control
- **Water Act (1974):** Water pollution prevention
- **Environment Protection Act (1986):** Comprehensive environmental law
- **Wildlife Protection Act (1972):** Biodiversity conservation
- **Forest Conservation Act (1980):** Forest protection

#### Mnemonic

All Water Environments Wildlife Forests (AWEWF)

### 0.0.10 10. Enlist various methods of rainwater harvesting.

#### Solution

**Rainwater harvesting** collects and stores rainwater for future use.

##### Methods:

- **Rooftop harvesting:** Direct collection from roofs
- **Surface runoff harvesting:** From ground surfaces
- **Recharge pits:** Groundwater recharging
- **Check dams:** Stream water collection

**Table 6.** Harvesting Methods

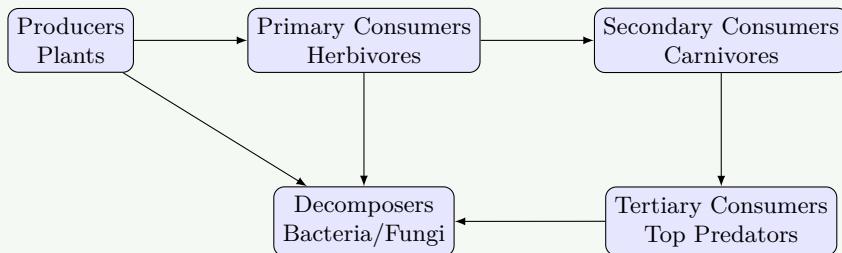
Method	Application	Benefit
Rooftop	Urban areas	Direct use
Surface	Rural areas	Large volume
Recharge	Water table	Groundwater

**Mnemonic**

Roofs Surface Recharge Check (RSRC)

**Question 2 [a marks]****3** Write short note on: Food chain.**Solution**

**Food chain** represents the flow of energy and nutrients through different trophic levels in an ecosystem.



- **Energy transfer:** Only 10% passes to next level
- **Biomass pyramid:** Decreases at higher levels

**Mnemonic**

Plants Provide Primary Power (Producer to Predator Path)

**Question 2 [a marks]****3** Explain factors affecting ecosystem.**Solution**

Ecosystems are influenced by various biotic and abiotic factors.

**Factors:**

- **Climate factors:** Temperature, rainfall, humidity
- **Soil factors:** pH, nutrients, texture
- **Biotic factors:** Species interactions, population density
- **Human factors:** Pollution, habitat destruction

**Table 7.** Ecosystem Factors

Factor Type	Components	Impact
Abiotic	Climate, Soil	Habitat conditions
Biotic	Organisms	Species interactions
Anthropogenic	Human activities	Ecosystem disruption

**Mnemonic**

Climate Soil Biology Humans (CSBH)

**Question 2 [b marks]****3 Write short note on: Virtual water****Solution**

**Virtual water** is the hidden water used in production of goods and services, representing total water consumption in supply chain.

**Examples:**

- **1 kg wheat:** 1,300 liters virtual water
- **1 kg beef:** 15,400 liters virtual water
- **1 cotton t-shirt:** 2,700 liters virtual water
- **Water footprint:** Total virtual water consumption
- **Trade implications:** Water-rich countries export virtual water

**Mnemonic**

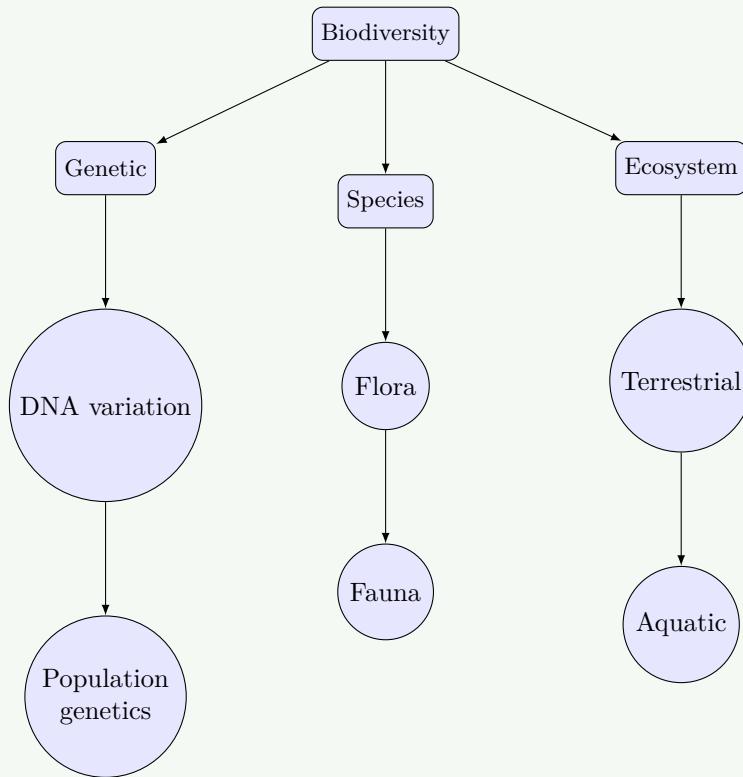
Virtual Water Worldwide (VWW)

**Question 2 [b marks]****3 What is biodiversity? Give its types.****Solution**

**Biodiversity** is the variety of life forms at genetic, species, and ecosystem levels on Earth.

**Types:**

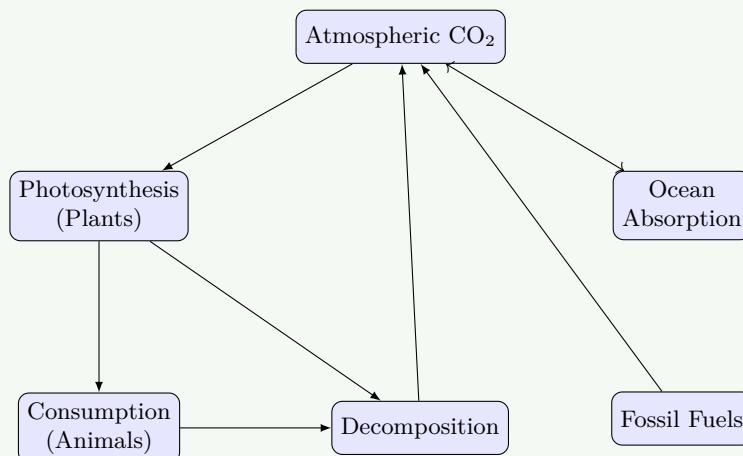
- **Genetic diversity:** Variation within species
- **Species diversity:** Number of different species
- **Ecosystem diversity:** Variety of habitats and communities

**Mnemonic**

Genes Species Ecosystems (GSE)

**Question 2 [c marks]****4 Explain: Carbon cycle****Solution**

**Carbon cycle** describes the movement of carbon through Earth's atmosphere, land, water, and organisms.

**Processes:**

- **Photosynthesis:** CO<sub>2</sub> absorption by plants
- **Respiration:** CO<sub>2</sub> release by organisms

- **Decomposition:** Carbon return to atmosphere
- **Ocean exchange:** CO<sub>2</sub> dissolution in seawater

**Mnemonic**

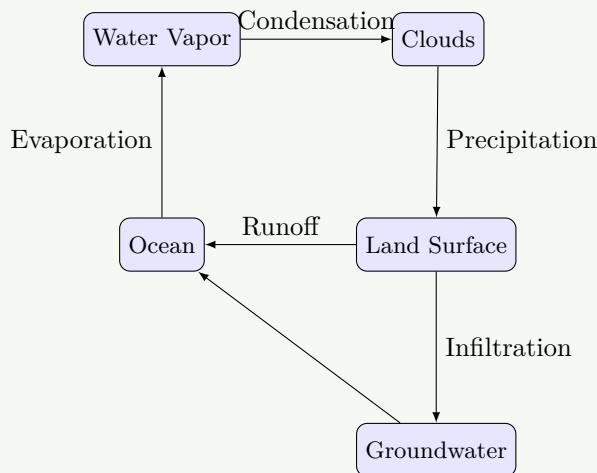
Plants Breathe, Die, Ocean (PBDO)

**Question 2 [c marks]**

4 Draw and explain the hydrologic cycle

**Solution**

**Hydrologic cycle** is the continuous movement of water through atmosphere, land, and oceans.

**Processes:**

- **Evaporation:** Water to vapor conversion
- **Condensation:** Vapor to liquid conversion
- **Precipitation:** Rain, snow formation
- **Infiltration:** Groundwater recharge

**Mnemonic**

Every Cloud Produces Rain (ECPR)

**Question 2 [d marks]**

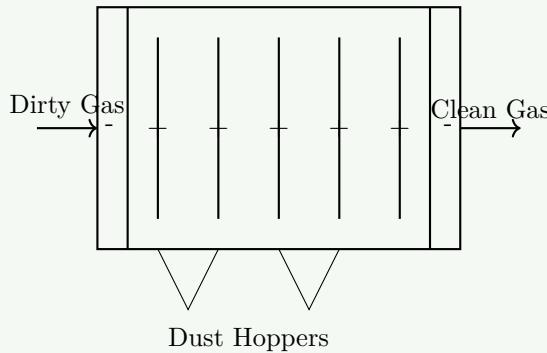
4 Enlist equipments used to control air pollution and explain any one.

**Solution**

Air pollution control equipment removes pollutants from industrial emissions.

**Equipment List:**

- **Cyclone separators:** Particulate removal
- **Electrostatic precipitators:** Fine particle collection
- **Bag filters:** Fabric filtration
- **Scrubbers:** Gas absorption

**Electrostatic Precipitator:**

- **Charging:** Particles acquire electric charge
- **Collection:** Charged particles attracted to plates
- **Efficiency:** 99% removal of fine particles

**Mnemonic**

Charge Collect Clean (CCC)

**Question 2 [d marks]**

4 Enlist the types of environmental pollution and give the effects of noise pollution

**Solution****Environmental pollution types:**

- **Air pollution:** Atmospheric contamination
- **Water pollution:** Aquatic contamination
- **Soil pollution:** Land contamination
- **Noise pollution:** Sound contamination

**Noise Pollution Effects:**

- **Health effects:** Hearing loss, stress, hypertension
- **Psychological effects:** Irritation, sleep disturbance
- **Performance effects:** Reduced concentration, productivity
- **Communication effects:** Speech interference

**Table 8. Noise Pollution Impacts**

Effect Type	Symptoms	Impact
<b>Physical</b>	Hearing damage	Permanent loss
<b>Mental</b>	Stress, anxiety	Health issues
<b>Social</b>	Communication problems	Relationship strain

**Mnemonic**

Air Water Soil Sound (AWSS)

**Question 3 [a marks]**

3 What is e-waste? Give effects of e-waste on environment and humans.

### Solution

**E-waste** (Electronic waste) consists of discarded electrical and electronic devices containing hazardous materials.

**Environmental Effects:**

- **Soil contamination:** Heavy metals leaching
- **Water pollution:** Toxic chemical runoff
- **Air pollution:** Burning releases toxic fumes

**Human Effects:**

- **Health hazards:** Lead, mercury poisoning
- **Respiratory problems:** Toxic gas inhalation
- **Skin disorders:** Direct contact with chemicals

**Table 9. E-waste Hazards**

Component	Hazard	Impact
Lead	Neurotoxin	Brain damage
Mercury	Toxic metal	Kidney damage
Cadmium	Carcinogen	Cancer risk

### Mnemonic

Electronic Equipment Endangers Everyone (E4)

## Question 3 [a marks]

3 What is plastic waste? Give effects of plastic waste.

### Solution

**Plastic waste** consists of discarded plastic materials that persist in environment due to non-biodegradable nature.

**Effects:**

- **Marine pollution:** Ocean plastic accumulation
- **Wildlife impact:** Entanglement, ingestion by animals
- **Soil degradation:** Reduced fertility and water infiltration
- **Human health:** Microplastics in food chain

**Categories:**

- **Single-use plastics:** Bags, bottles, straws
- **Packaging waste:** Food containers, wrappings
- **Industrial plastic:** Manufacturing waste

### Mnemonic

Plastic Persists, Problems Persist (PPPP)

## Question 3 [b marks]

3 Give main sources of solid waste.

### Solution

**Solid waste** originates from various human activities and natural processes.

**Sources:**

- **Residential:** Household garbage, food waste

- **Commercial:** Office waste, packaging materials
- **Industrial:** Manufacturing waste, chemicals
- **Agricultural:** Crop residues, animal waste
- **Municipal:** Street sweeping, park maintenance

**Table 10.** Solid Waste Sources

Source	Waste Type	Management
<b>Domestic</b>	Organic, Plastic	Collection
<b>Industrial</b>	Hazardous, Non-hazardous	Treatment
<b>Agricultural</b>	Biodegradable	Composting

**Mnemonic**

Residential Commercial Industrial Agricultural Municipal (RCIAM)

**Question 3 [b marks]**

3 Enlist various methods of solid waste disposal and explain any one.

**Solution****Disposal Methods:**

- **Landfilling:** Controlled waste burial
- **Incineration:** Waste burning with energy recovery
- **Composting:** Organic waste decomposition
- **Recycling:** Material recovery and reuse

**Sanitary Landfill:**

- **Design:** Engineered system with liners
- **Operation:** Daily cover, compaction
- **Environmental protection:** Leachate and gas control

**Mnemonic**

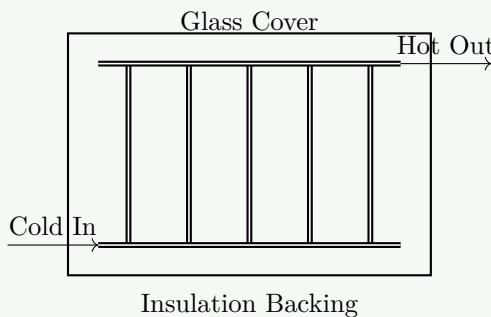
Land Incinerate Compost Recycle (LICR)

**Question 3 [c marks]**

4 Explain the working of Liquid Flat Plate Collector with a neat sketch.

### Solution

**Liquid Flat Plate Collector** converts solar radiation into thermal energy for heating water.



#### Working:

- **Solar absorption:** Black absorber plate captures solar energy
- **Heat transfer:** Absorbed heat transfers to flowing liquid
- **Circulation:** Heated liquid rises, cool liquid enters
- **Insulation:** Minimizes heat losses

#### Components:

- **Transparent cover:** Reduces convection losses
- **Absorber plate:** Maximum solar absorption
- **Heat transfer fluid:** Water or antifreeze solution

#### Mnemonic

Solar Absorption Creates Heat Transfer (SACHT)

## Question 3 [c marks]

### 4 Write short note on solar pond

### Solution

**Solar pond** is a pool of saltwater that acts as both solar collector and thermal storage system.

#### Structure:

- **Upper zone:** Low salt concentration
- **Middle zone:** Increasing salt gradient
- **Lower zone:** High salt concentration

#### Working:

- **Density gradient:** Prevents convection mixing
- **Heat storage:** Bottom layer stores thermal energy
- **Temperature:** Can reach 70-85°C at bottom

#### Applications:

- **Power generation:** Steam production
- **Industrial heating:** Process heat supply
- **Desalination:** Water purification

#### Mnemonic

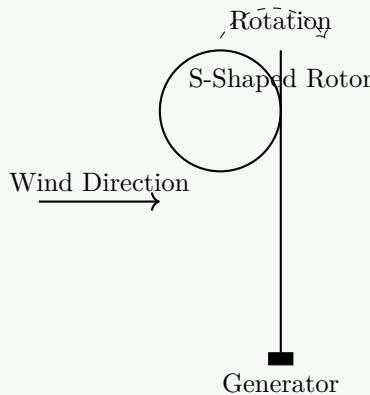
Salt Stores Solar Thermal (SSST)

## Question 3 [d marks]

4 Explain Savonious wind mill with a neat sketch.

### Solution

**Savonius wind turbine** is a vertical axis wind turbine with S-shaped rotor blades.



#### Working:

- **Drag principle:** Wind creates differential drag on blades
- **Rotation:** S-shape causes continuous rotation
- **Self-starting:** Starts at low wind speeds
- **Vertical axis:** Independent of wind direction

#### Advantages:

- **Simple design:** Low maintenance requirements
- **Low noise:** Quiet operation
- **All wind directions:** Omnidirectional capability

#### Disadvantages:

- **Lower efficiency:** 20-30% compared to HAWT
- **Space requirement:** Larger area needed

### Mnemonic

S-Shape Starts Slowly (SSS)

## Question 3 [d marks]

4 Give the comparison between Horizontal Axis and Vertical Axis wind mills.

### Solution

Wind turbines are classified based on rotor axis orientation.

**Table 11.** HAWT vs VAWT Comparison

Parameter	Horizontal Axis (HAWT)	Vertical Axis (VAWT)
<b>Efficiency</b>	35-45%	20-30%
<b>Wind direction</b>	Must face wind	Any direction
<b>Installation</b>	Tower required	Ground level possible
<b>Maintenance</b>	Difficult access	Easy access
<b>Noise</b>	Higher	Lower
<b>Cost</b>	Higher	Lower

**HAWT Features:**

- **Upwind design:** Rotor faces wind
- **Pitch control:** Blade angle adjustment
- **Yaw system:** Wind direction tracking

**VAWT Features:**

- **Omnidirectional:** No wind tracking needed
- **Ground installation:** Easier maintenance
- **Lower wind speeds:** Better performance

**Mnemonic**

Horizontal High, Vertical Versatile (HHVV)

**Question 4 [a marks]**

3 Give effects of climate change.

**Solution**

Climate change causes widespread environmental and socio-economic impacts globally.

**Environmental Effects:**

- **Temperature rise:** Global average increase
- **Sea level rise:** Thermal expansion and ice melting
- **Weather extremes:** Intense storms, droughts, floods
- **Ecosystem shifts:** Species migration and extinction

**Socio-economic Effects:**

- **Agricultural impact:** Crop yield changes
- **Water resources:** Availability and quality issues
- **Human health:** Heat stress, disease spread
- **Economic losses:** Infrastructure damage

**Table 12.** Climate Change Impacts

Impact Category	Examples	Severity
<b>Environmental</b>	Melting glaciers	High
<b>Agricultural</b>	Crop failure	Medium
<b>Health</b>	Heat waves	High

**Mnemonic**

Temperature Sea Weather Ecosystem (TSWE)

## Question 4 [a marks]

3 Write a short note on Green House gases.

### Solution

**Greenhouse gases** trap heat in Earth's atmosphere, causing global warming through greenhouse effect.

#### Major Greenhouse Gases:

- Carbon dioxide (CO<sub>2</sub>): 76% of emissions
- Methane (CH<sub>4</sub>): 16% of emissions
- Nitrous oxide (N<sub>2</sub>O): 6% of emissions
- Fluorinated gases: 2% of emissions

#### Sources:

- CO<sub>2</sub>: Fossil fuel burning, deforestation
- CH<sub>4</sub>: Agriculture, landfills, livestock
- N<sub>2</sub>O: Fertilizers, fossil fuel combustion

#### Global Warming Potential:

- CO<sub>2</sub>: Reference (GWP = 1)
- CH<sub>4</sub>: 25 times CO<sub>2</sub>
- N<sub>2</sub>O: 298 times CO<sub>2</sub>

### Mnemonic

Carbon Methane Nitrous Fluorine (CMNF)

## Question 4 [b marks]

4 Explain climate change Management.

### Solution

**Climate change management** involves strategies to reduce greenhouse gas emissions and adapt to climate impacts.

#### Mitigation Strategies:

- **Renewable energy**: Solar, wind, hydroelectric power
- **Energy efficiency**: Improved building designs, LED lighting
- **Carbon sequestration**: Forest conservation, tree planting
- **Sustainable transport**: Electric vehicles, public transport

#### Adaptation Strategies:

- **Infrastructure resilience**: Flood defenses, drought-resistant crops
- **Water management**: Rainwater harvesting, efficient irrigation
- **Coastal protection**: Sea walls, mangrove restoration
- **Emergency preparedness**: Early warning systems

#### Policy Measures:

- **Carbon pricing**: Tax on emissions
- **Renewable energy targets**: Clean energy goals
- **Building codes**: Energy efficiency standards

### Mnemonic

Mitigation Adaptation Policy (MAP)

## Question 4 [b marks]

4 Give effects of ozone layer depletion.

## Solution

**Ozone layer depletion** reduces stratospheric ozone, allowing harmful UV radiation to reach Earth.

### Effects on Humans:

- **Skin cancer:** Increased UV-B radiation exposure
- **Eye cataracts:** UV damage to eye lens
- **Immune suppression:** Weakened immune system
- **Premature aging:** Skin damage acceleration

### Effects on Environment:

- **Crop damage:** Reduced agricultural productivity
- **Marine ecosystem:** Phytoplankton reduction
- **Material degradation:** Plastic and rubber damage
- **Climate change:** Ozone as greenhouse gas

**Table 13.** UV Radiation Effects

UV Type	Wavelength	Effect
UV-A	320-400 nm	Skin aging
UV-B	280-320 nm	Sunburn, cancer
UV-C	200-280 nm	Blocked by ozone

### Mnemonic

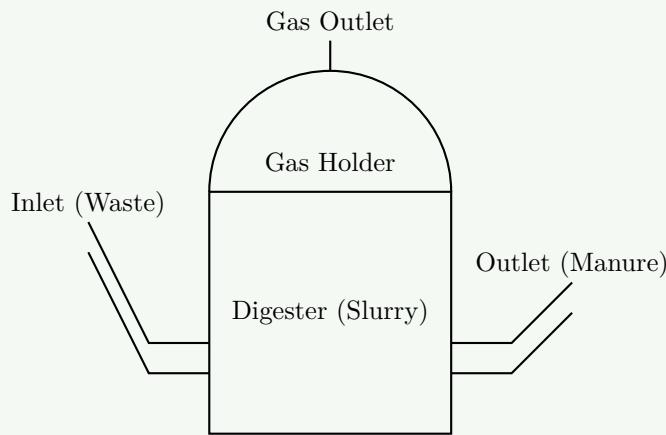
Skin Eyes Immunity Climate (SEIC)

## Question 4 [c marks]

7 Explain biogas plant with sketch.

## Solution

**Biogas plant** produces methane-rich gas through anaerobic digestion of organic waste.



### Components:

- **Digester tank:** Anaerobic fermentation chamber
- **Gas dome:** Biogas collection and storage
- **Inlet pipe:** Waste material feeding
- **Outlet pipe:** Digested slurry removal

### Process:

- **Hydrolysis:** Complex organics break down
- **Acidogenesis:** Acid-forming bacteria action

- **Methanogenesis:** Methane-producing bacteria
- **Gas production:** 50-70% methane, 30-40% CO<sub>2</sub>

**Operating Conditions:**

- **Temperature:** 30-40°optimal
- **pH:** 6.8-7.2 range
- **Retention time:** 15-30 days
- **C:N ratio:** 20-30:1 optimal

**Applications:**

- **Cooking fuel:** Household energy needs
- **Lighting:** Gas lamp illumination
- **Electricity:** Generator power
- **Fertilizer:** Nutrient-rich slurry

**Advantages:**

- **Renewable energy:** Sustainable fuel source
- **Waste management:** Organic waste utilization
- **Environmental benefits:** Reduced methane emissions
- **Economic benefits:** Cost savings on fuel

**Mnemonic**

Biogas Benefits: Renewable Waste Environment Economy (BRWEE)

## Question 5 [a marks]

4 Write short note on global warming.

**Solution**

**Global warming** refers to long-term increase in Earth's average surface temperature due to human activities.

**Causes:**

- **Greenhouse gases:** CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O emissions
- **Deforestation:** Reduced carbon absorption
- **Industrial activities:** Fossil fuel combustion
- **Transportation:** Vehicle emissions

**Effects:**

- **Temperature rise:** 1.1°since pre-industrial times
- **Ice melting:** Arctic sea ice, glaciers shrinking
- **Sea level rise:** Coastal flooding threat
- **Weather changes:** Extreme events frequency

**Evidence:**

- **Temperature records:** Warmest years in recent decades
- **Ice core data:** Historical CO<sub>2</sub> levels
- **Satellite measurements:** Global temperature monitoring

**Solutions:**

- **Renewable energy:** Clean power sources
- **Energy efficiency:** Reduced consumption
- **Carbon capture:** Technology development
- **International cooperation:** Paris Agreement

**Mnemonic**

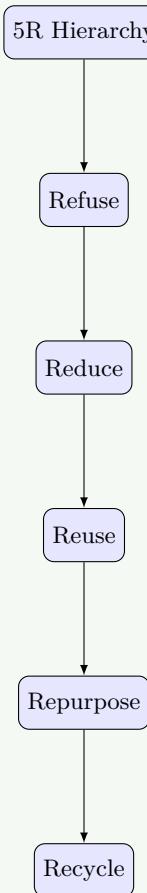
Greenhouse Gases Generate Global Change (GGGC)

## Question 5 [b marks]

4 Explain 5R concept.

### Solution

**5R concept** is waste management hierarchy for sustainable resource utilization.



#### The 5 R's:

##### 1. Refuse:

- **Avoid unnecessary items:** Say no to single-use products
- **Examples:** Plastic bags, straws, excessive packaging

##### 2. Reduce:

- **Minimize consumption:** Use less resources
- **Examples:** Energy conservation, water saving

##### 3. Reuse:

- **Multiple use:** Extend product life
- **Examples:** Glass jars as containers, paper both sides

##### 4. Repurpose:

- **Creative reuse:** New function for old items
- **Examples:** Tire planters, bottle bird feeders

##### 5. Recycle:

- **Material recovery:** Process into new products
- **Examples:** Paper, plastic, metal recycling

#### Benefits:

- **Waste reduction:** Less landfill burden
- **Resource conservation:** Natural resource preservation
- **Cost savings:** Economic benefits
- **Environmental protection:** Pollution reduction

**Mnemonic**

Refuse Reduce Reuse Repurpose Recycle (R5)

**Question 5 [c marks]**

**3 Explain the benefits of Green building.**

**Solution**

**Green building** incorporates sustainable design and construction practices for environmental and human benefits.

**Environmental Benefits:**

- **Energy efficiency:** Reduced power consumption
- **Water conservation:** Efficient water systems
- **Waste reduction:** Construction and operational waste minimization

**Economic Benefits:**

- **Operating cost savings:** Lower utility bills
- **Increased property value:** Market premium
- **Tax incentives:** Government rebates

**Health Benefits:**

- **Indoor air quality:** Better ventilation systems
- **Natural lighting:** Improved occupant comfort
- **Toxic material reduction:** Healthier environment

**Table 14. Green Building Impacts**

Benefit Type	Examples	Impact
<b>Environmental</b>	Energy saving	30-50% reduction
<b>Economic</b>	Cost savings	20% operating costs
<b>Health</b>	Air quality	Productivity increase

**Mnemonic**

Green Buildings Give Environmental Economic Health (GBEEH)

**Question 5 [d marks]**

**3 Enlist various Acts related to environment in India and explain any one.**

**Solution**

**Environmental Acts in India:**

- **Water (Prevention and Control of Pollution) Act, 1974**
- **Air (Prevention and Control of Pollution) Act, 1981**
- **Environment Protection Act, 1986**
- **Wildlife Protection Act, 1972**
- **Forest (Conservation) Act, 1980**
- **Biodiversity Act, 2002**

**Environment Protection Act, 1986:**

**Objectives:**

- **Comprehensive framework:** Overall environmental protection

- **Pollution prevention:** Air, water, soil contamination control
- **Standard setting:** Environmental quality standards
- **Enforcement:** Penalties for violations

**Powers:**

- **Central government authority:** Environmental regulations
- **Inspection rights:** Industrial facilities monitoring
- **Closure orders:** Non-compliant industries
- **Emergency measures:** Environmental hazards response

**Significance:**

- **Umbrella legislation:** Covers all environmental aspects
- **Post-Bhopal disaster:** Response to industrial accidents

**Mnemonic**

Water Air Environment Wildlife Forest Biodiversity (WAEWFB)