

The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect. The shapes are layered, with some appearing more prominent than others, and they extend from the edges towards the center of the frame.

# The Ecosystem

An Introduction

# What is an ecosystem?

↳ **SYSTEM** = regularly interacting and interdependent components forming a unified whole.

↳ **ECOSYSTEM = an ecological system;**

= a community and its physical environment treated together as a functional system.

↳ **An ecosystem is composed of the organisms and physical environment of a specified area.**

It can be MICRO TO MACRO

# ECOSYSTEM

- A community of interdependent organisms and the interactions with the physical environment in which they live.
- It can also be defined as the abiotic and biotic factors and the interactions between them.
- The interaction between organisms and the environment is the key!

Contd....

## **BIOTIC**

The biotic components are:

**AUTOTROPH (PLANT)  
and  
HETEROTROPHS (ANIMALS)**

❑ **AUTOTROPHS: Producing food on its own**

❑ **HETEROTROPH – CONSUMER**

■ **Primary consumer (herbivores) plant eaters**

■ **Secondary consumer (carnivores) Flesh eaters**

■ **Tertiary consumer (top carnivores) flesh eaters**



# Biotic and Abiotic factors

- Biotic Factor: A living, biological factor that may influence an organism or a system.

Example: disease, competition

Abiotic factor: Non-living physical factor also influence the Biotic elements-

Examples: Temperature, rainfall, salinity, soil acidity, light

# ECOSYSTEMS: FUNDAMENTAL CHARACTERISTICS

## STRUCTURE:

- ❖ Living (biotic)
- ❖ Nonliving (abiotic)

## PROCESS:

- ❖ Energy flow
- ❖ Cycling of matter (chemicals)

## CHANGE:

- ❖ Dynamic (not static)
- ❖ Succession, etc.

# ENERGY FLOW IN ECOSYSTEMS

↳ All living organisms need energy, for growth, maintenance, reproduction, locomotion, etc.



# FORMS OF ENERGY

Energy has different forms, such as

HEAT ENERGY

LIGHT ENERGY

MECHANICAL ENERGY

CHEMICAL ENERGY (CARBOHYDRATES)

# LAWS of THERMODYNAMICS

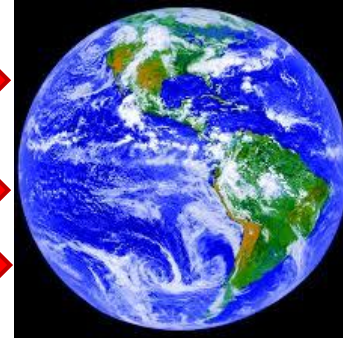
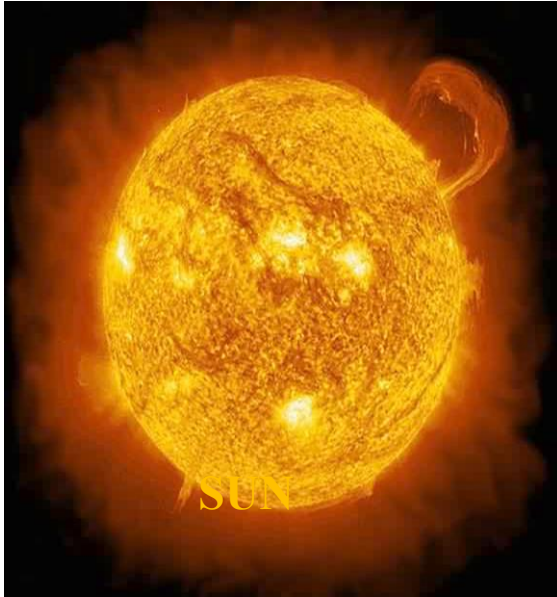
## FIRST LAW of THERMODYNAMICS:

↳ Energy can be converted from one form to another but cannot be created or destroyed.

## SECOND LAW of THERMODYNAMICS

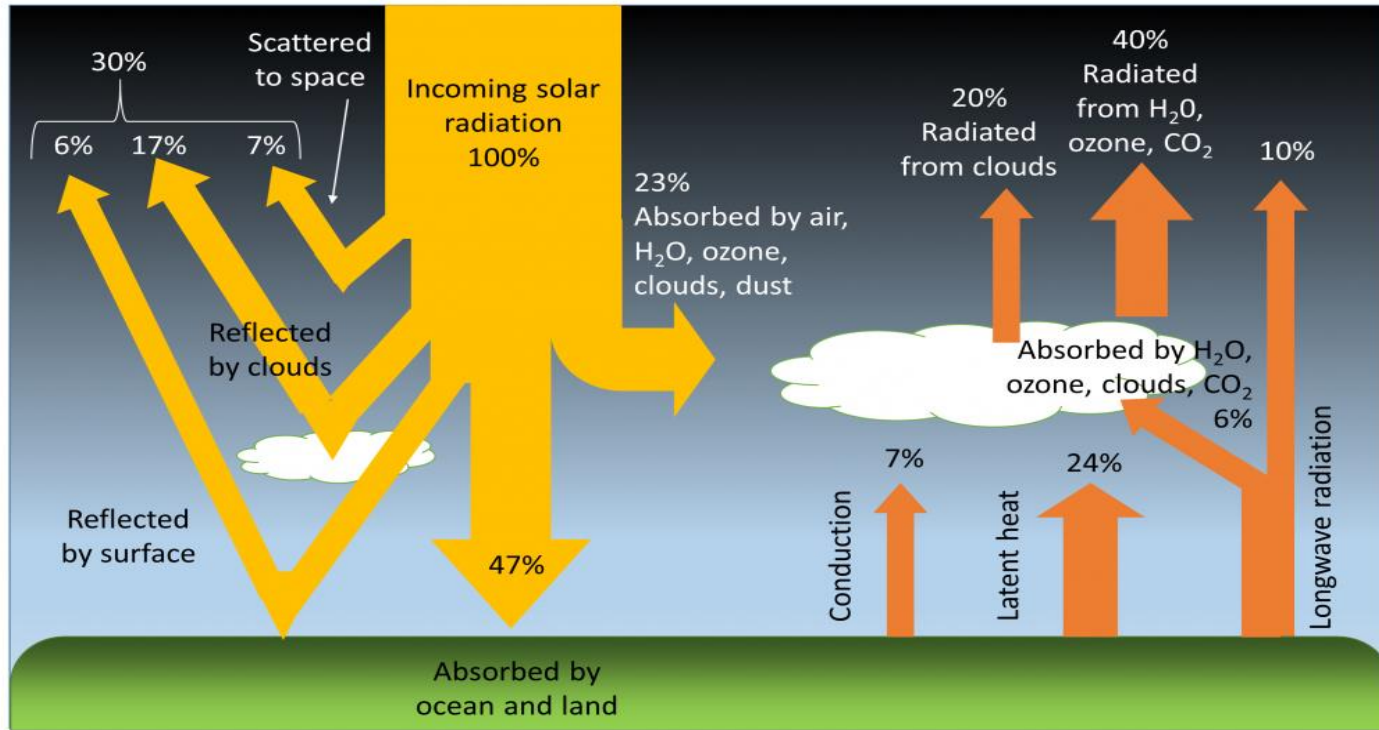
↳ Transformations of energy always result in some loss or dissipation of energy

# INCOMING SOLAR RADIATION



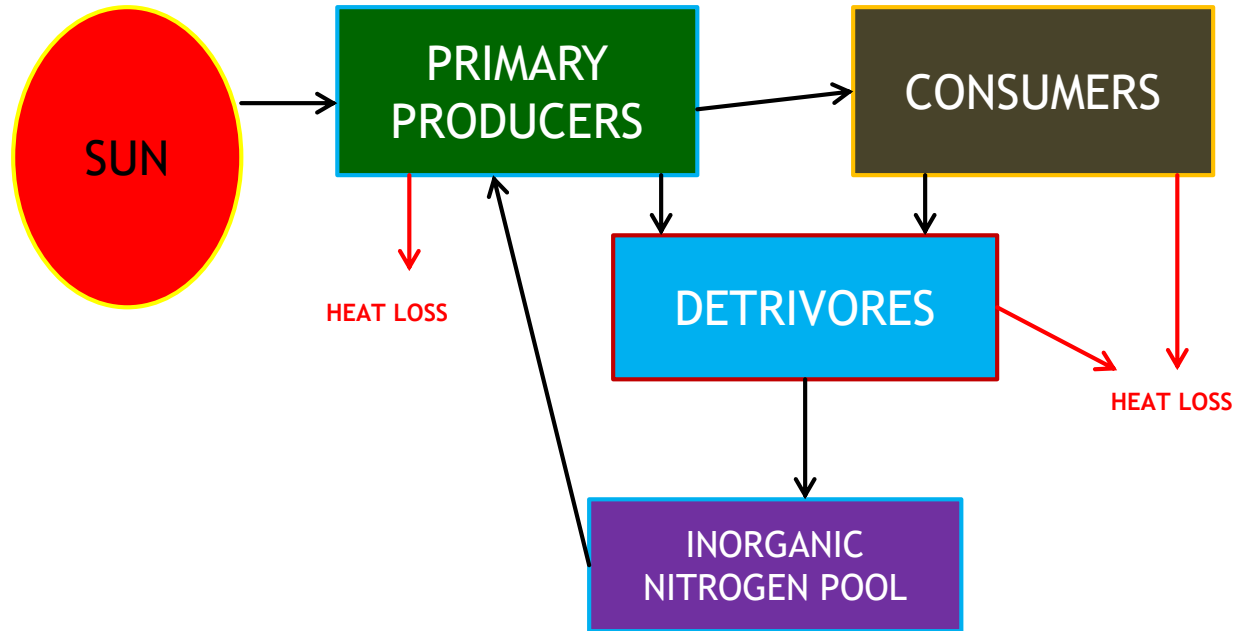
DISTANCE between Sun and the Earth is 150 million Kms

# EARTH'S HEAT BALANCE



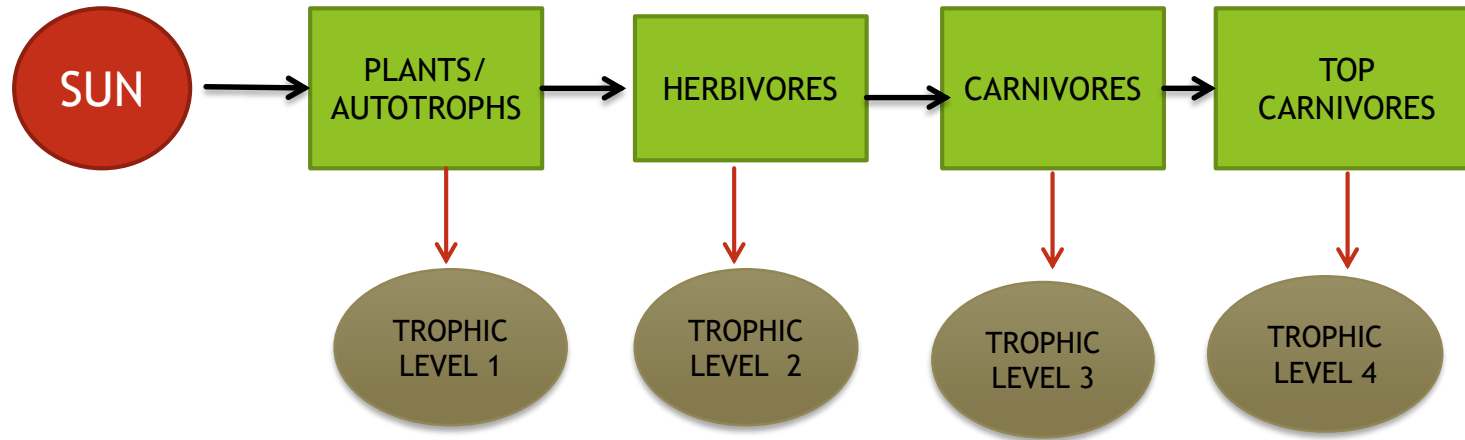
# The ENERGY FLOW IN THE ECOSYSTEM

# ENERGY FLOW IN THE ECOSYSTEM



# TROPHIC LEVELS

- TROPHIC LEVEL: FEEDING LEVEL. LEVEL at which energy consumed and Distributed.




# DECOMPOSER

An organism which gets its energy by breaking down dead organic matter, including dead animals, dead plants and animal waste, into more simple substances.

Examples: bacteria and fungi.

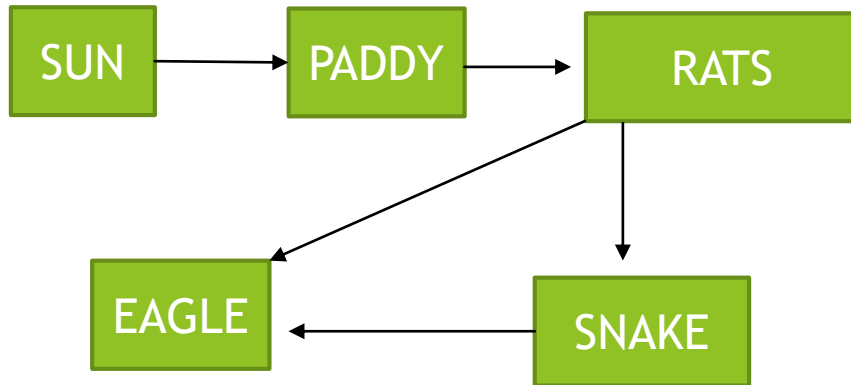
**Role of decomposers is to return valuable nutrients to the system so they can be used again and again.**



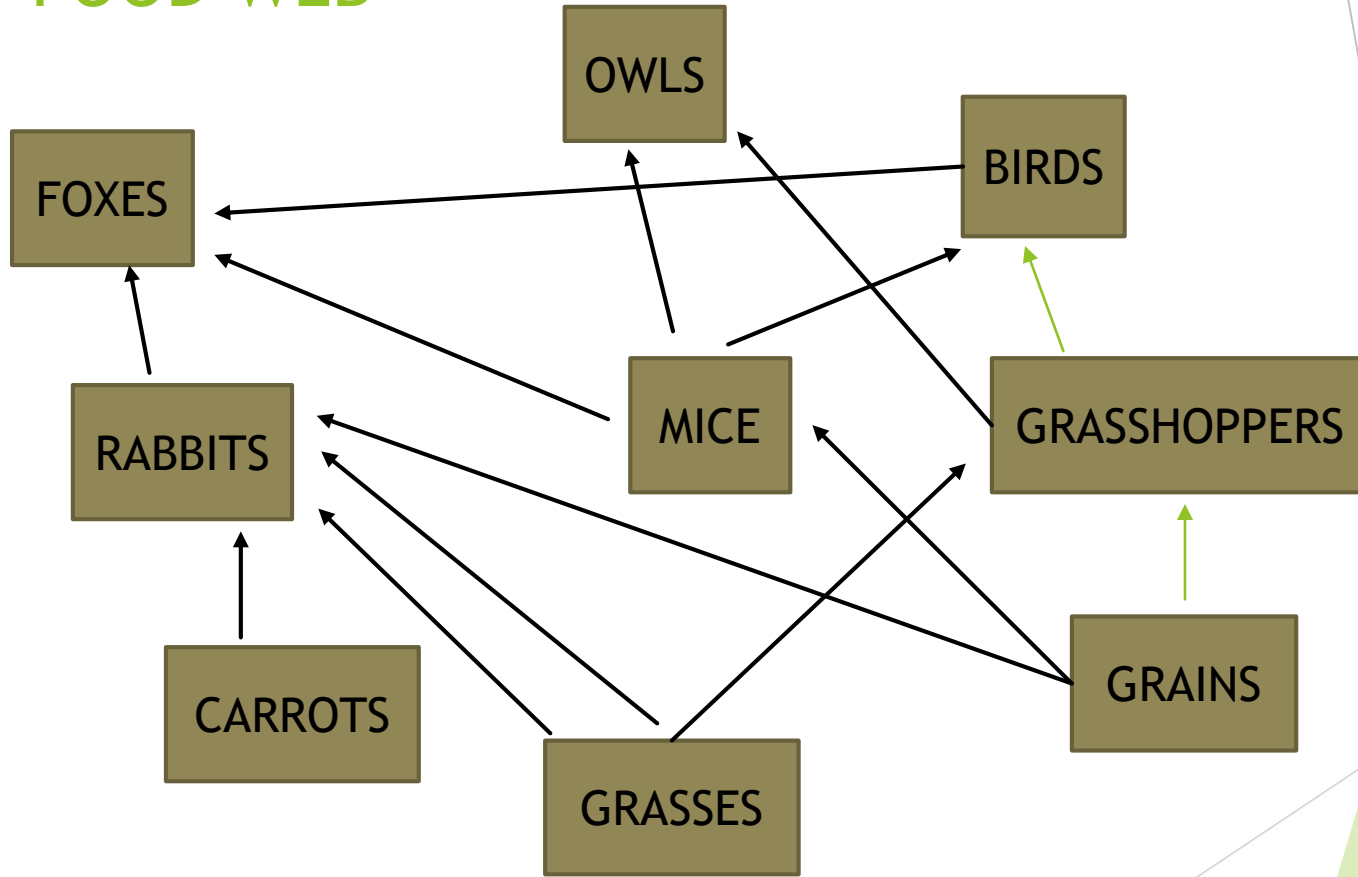
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# The FOOD CHAIN AND FOOD WEB and WATER CYCLE

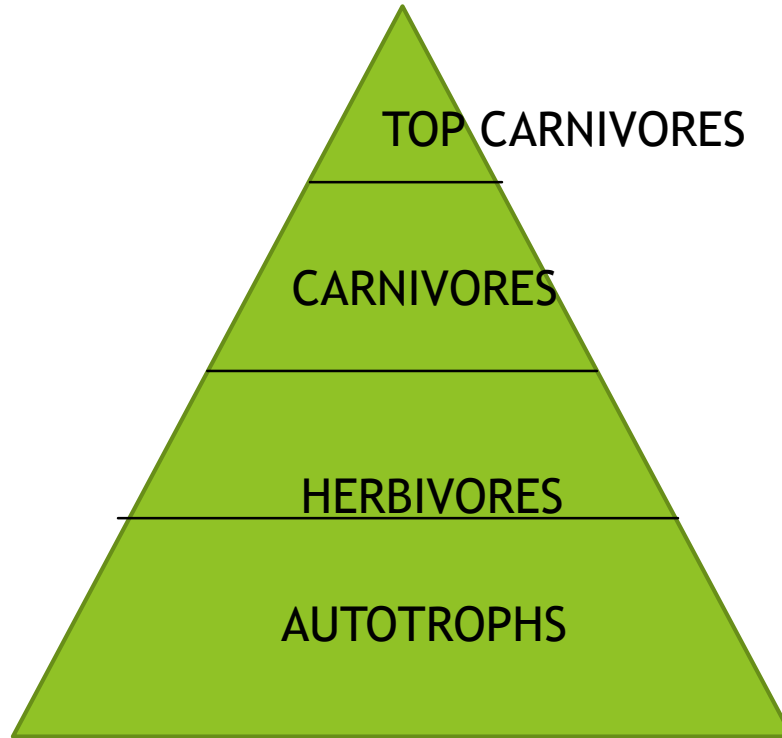
# FOOD CHAIN



# FOOD WEB



# FOOD PYRAMID



# FOOD CHAINS AND PYRAMIDS

Pyramid diagrams give information about the organisms in a food chain. There are three types of pyramids:

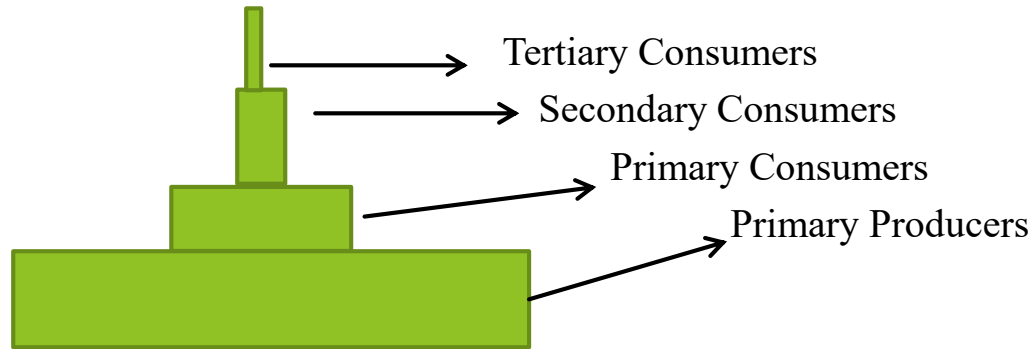
Pyramid of numbers

Pyramid of biomass: **Biomass** is biological material

Pyramid of productivity

# PYRAMID OF NUMBER

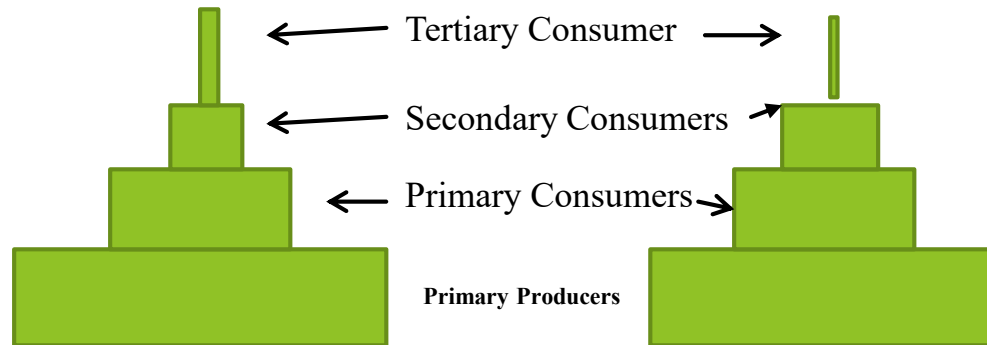
This show numbers of organisms at different trophic levels, which depend on



A graphical representation of the numbers of individual in each population in a food chain.

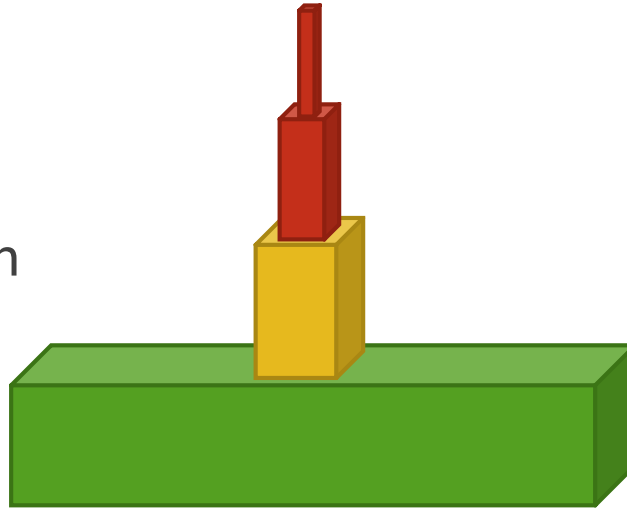
## PYRAMID OF BIOMASS

## PYRAMID OF PRODUCTIVITY/ENERGY



# PYRAMID OF BIOMASS

- is a graphical representation designed to show the **biomass** or bio productivity at each trophic level in a given ecosystem.





# BIO GEOCHEMICAL CYCLES

Is a pathway by which a chemical substance moves through both biotic (biosphere) and abiotic (lithosphere, atmosphere, and hydrosphere) compartments of Earth.

# BIOGEOCHEMICAL CYCLES

WATER CYCLE

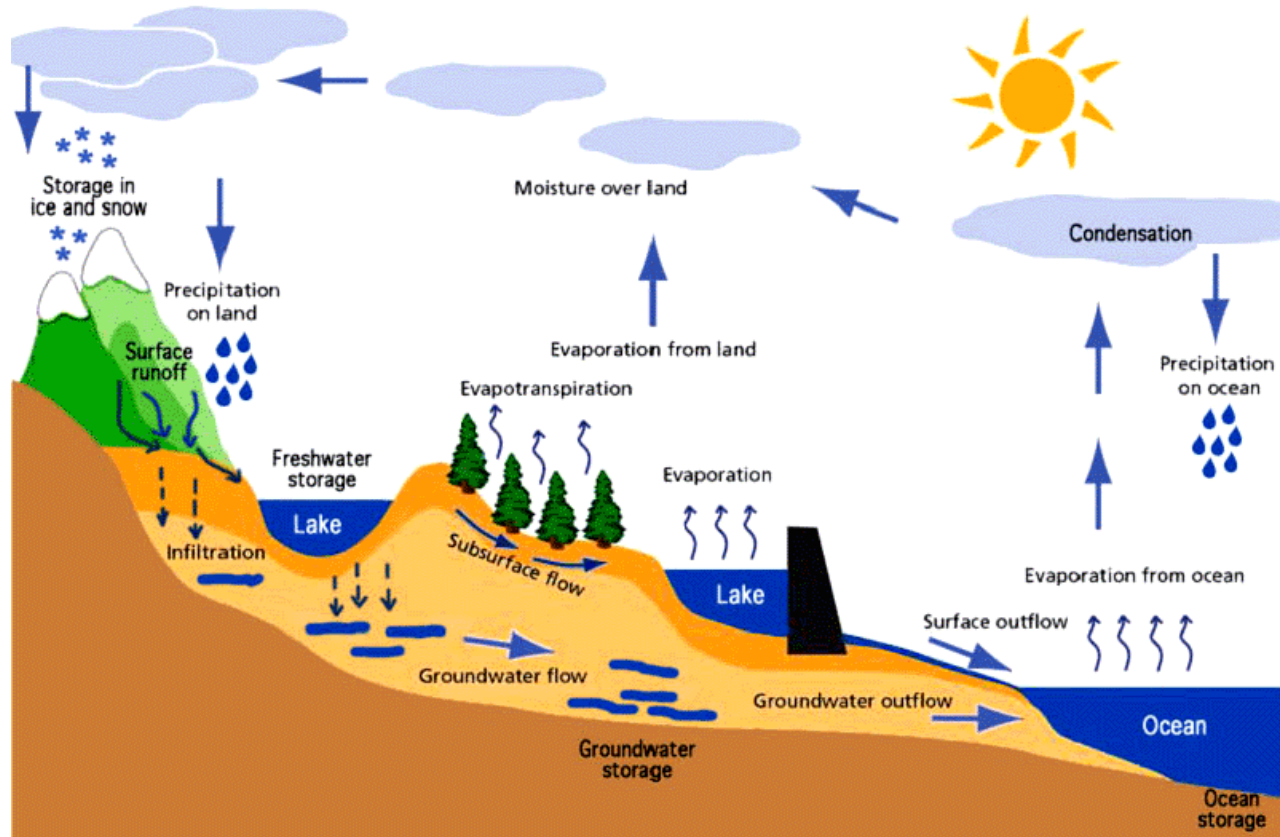
CARBON CYCLE

NITROGEN CYCLE

OXYGEN CYCLE

PHOSPEROUS CYCLE

# WATER CYCLE



## WATER ON THE EARTH

- ▶ Although 79% of the earth is covered in water with 97.5% of it is salt water.
- ▶ ONLY 3% OF THE WATER IS FRESHWATER.
- ▶ Most of the freshwater is in glaciers and ice caps.
- ▶ Less than 1% of the freshwater on the earth is readily available.

## HUMAN IMPACT ON WATER CYCLE

- ▶ Chemical fertilizers and pesticides mix with water can pollute surface water or seep into the ground to contaminate groundwater
- ▶ Clear-cutting forests reduces the amount of water plants return to the atmosphere by transpiration.

- ▶ Sediment (soil/ silt) thicken the water and make it difficult for aquatic plants to grow.
- ▶ Excess nutrients can cause growth of excess algae. When they die, they decompose in a process that reduces the oxygen level in the water.
- ▶ Debris such as plastic bags, plastic bottles etc. can wash into water bodies and choke, suffocate, or disable ducks, fish, turtles, and birds.
- ▶ Household hazardous wastes like insecticides, pesticides, paint, solvents, and used motor oil can poison aquatic life.

# SELF STUDY

CARBON CYCLE  
OXYGEN CYCLE  
NITRIGEN CYCLE

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# The NATURAL SELECTION & IMPORTANCE OF ENVIRONMENTAL STUDIES



# NATURAL SELECTION

- ▶ **Natural selection** is the process in nature by which organisms better adapted to their environment tend to survive and reproduce more than those less adapted to their environment.
- ▶ The mechanism that Darwin proposed for evolution is **natural selection**. Because resources are limited in nature, organisms with heritable traits that favor survival and reproduction will tend to leave more offspring than their peers, **causing** the traits to increase in frequency over generations.

# SYMBIOTIC RELATIONSHIP



ENVTSDS/DSARKAR/FYBCOM/2020-21



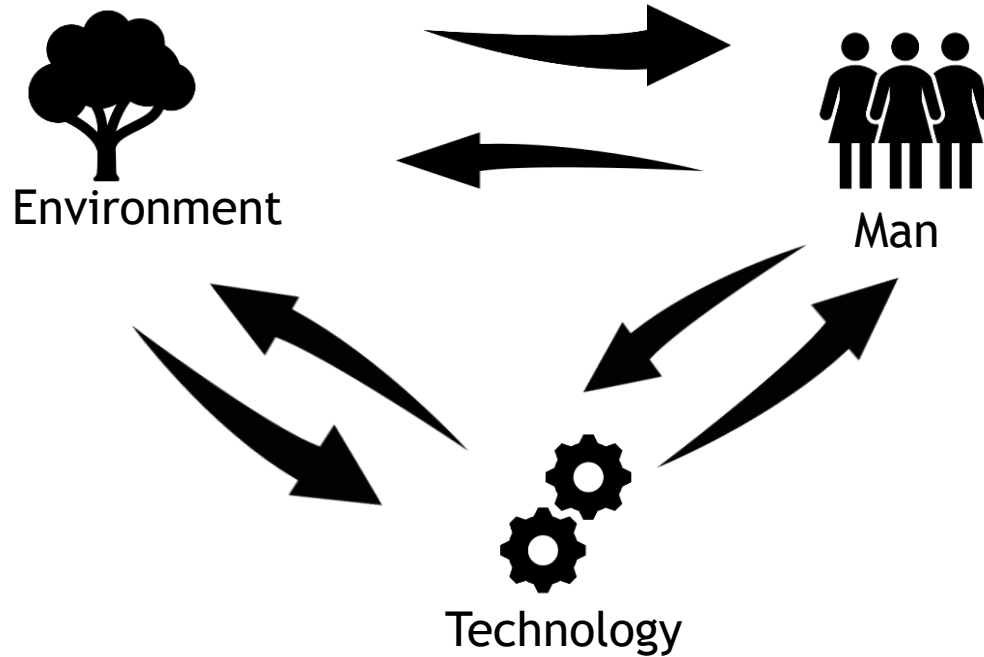
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# MAN-ENVIRONMENT RELATIONSHIP



# MAN-ENVIRONMENT -TECHNOLOGY RELATIONSHIPS



# WHY STUDY ENVIRONMENTAL STUDIES?

- ▶ Environment studies is all about learning the way we should live.
- ▶ Learning sustainable strategies to protect the environment.
- ▶ Understanding the physical aspects of the environment.
- ▶ Understanding the need to conserve biodiversity.
- ▶ Try to adopt a more sustainable lifestyle and utilize resources in a judicious way.
- ▶ To create awareness in the society on major environmental problems.

Keeping these in mind the University Grants Commission (UGC) through the universities has made it mandatory to introduce a course in environmental studies..

# Few important aspects of studying Environmental Studies

- ▶ To know about use of Resources sustainably
- ▶ Create awareness about preserving the environment.
- ▶ Participate in the mass movement to protect nature.
- ▶ learn a healthy learning environment
- ▶ Taking a full-time career in environment studies

# QUESTIONS and ANSWERS UNIT-1



- Q.1 What is ecosystem?
- Ans. Any unit that includes all of the organisms in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles within the system is an ecosystem. For example fish tank.

Q.2 What are types of environment?

Ans. There are two types of environment. 1) Physical or Natural and 2) Human or Cultural.

Q.3 What are the types of Physical or Natural environment with examples?

Ans. Physical or Natural environment are divided in to two types i) Biotic (e.g. Plant and animal) and ii) Abiotic environment(e.g. rock ,atmosphere).



- Q.4. Name the types of ecosystem.

Ans. There are various types of ecosystems. For example: Marine Ecosystem, Terrestrial Ecosystem.

Q.5. What is photosynthesis?

Ans. Process by which plants or primary producers convert light energy into chemical energy or carbohydrates is called photosynthesis.

Q.6. Give examples of biogeochemical cycles.

Ans. Water cycle, oxygen cycle carbon cycle.

- Q.7. Define food chain and food web.

Simple process by which food is transferred from one living species to another is called food chain, e.g.



Complex process by which food is transferred from one living species to another is called food web, e.g.



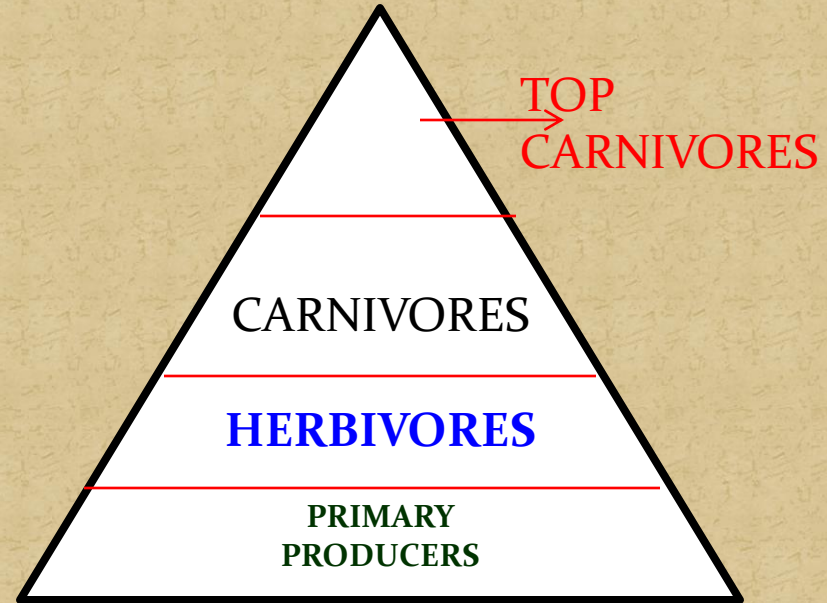
- Q.8 What is evapotranspiration?
- Release of water in the atmosphere by plants is known as evapotranspiration.
- Q.9. What is runoff ?
- Surface flow of water is called runoff.
- Q.10 What is trophic level ?
- Feeding level i.e. stage or level at which plants or animals get their food or feed other, is known as trophic level.

- Q.11. Name primary producer.
- Plant is a primary producer.
- Q.12. Why plant is called primary producer ?
- Plant can produce food/energy or carbohydrate and supply the same to other living species, hence called primary producer. Only plant can produce food/energy and others consume.
- Q.13. Who are herbivores?
- Grass eaters are known as herbivores. Example Cow/Deer

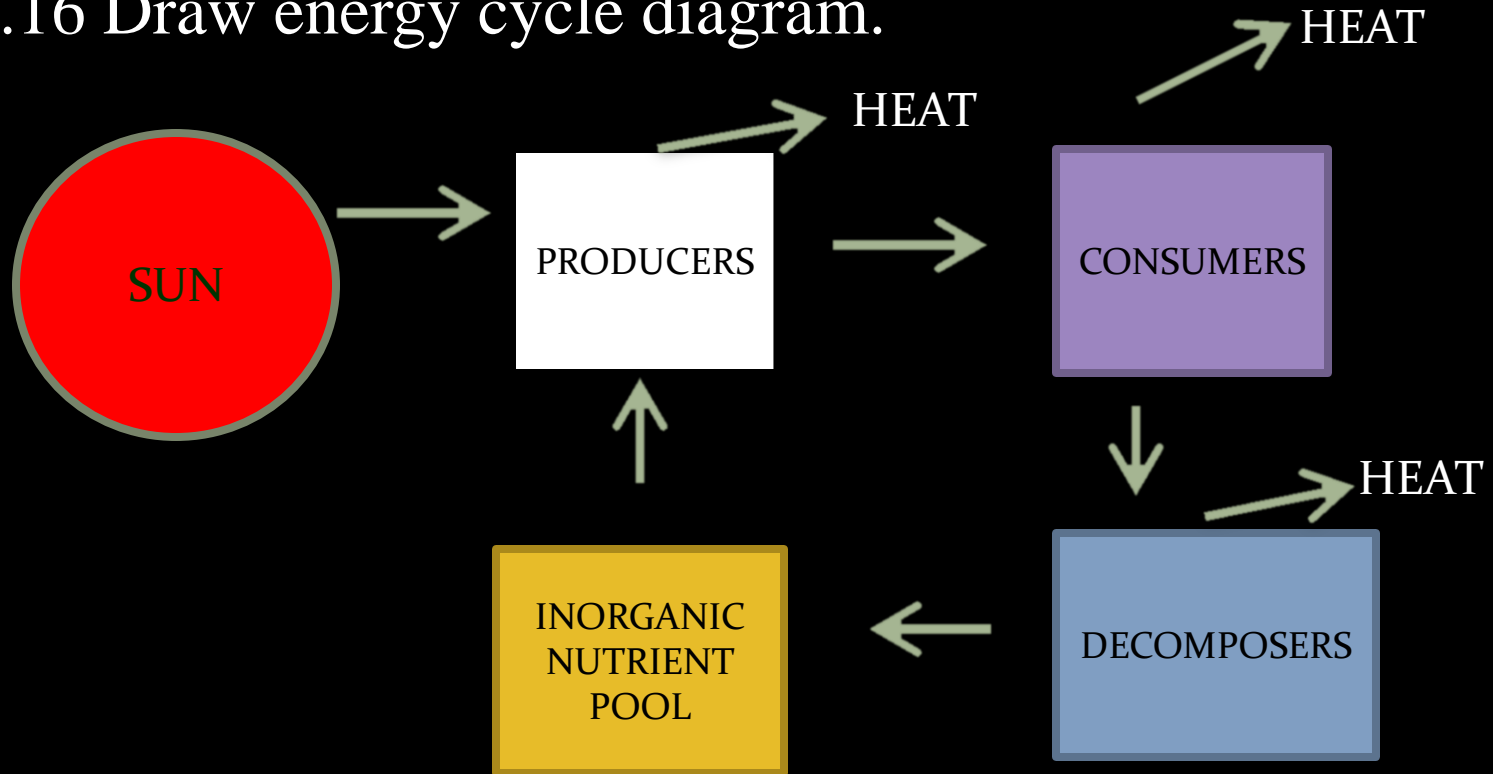


- Q.14. What are carnivores ?
- Flesh eaters are known as carnivores. Example: lion/tiger.
- Q.15.What is energy pyramid ?

Representation of trophic structure and function of an ecosystem graphically starting with producers at the base level followed by other trophic levels is known as ecological pyramid.



- Q.16 Draw energy cycle diagram.



- Q.17 What is structure of ecosystem ?

Ecosystem is consisting of the following:

i) PRODUCERS: or AUTOTROPHS i.e. plants.

ii) HETEROTROPHS: or CONSUMERS

a) Herbivores- grass eaters

b) Carnivores-flesh eaters

iii) DETRIVORES: or DECOMPOSERS

- Q.18. What are the components of abiotic environment ?

i) Location, ii) size, iii) shape, iv) soil, v) minerals,  
vi) climate, viii) topography

Q.19 What is global warming ?

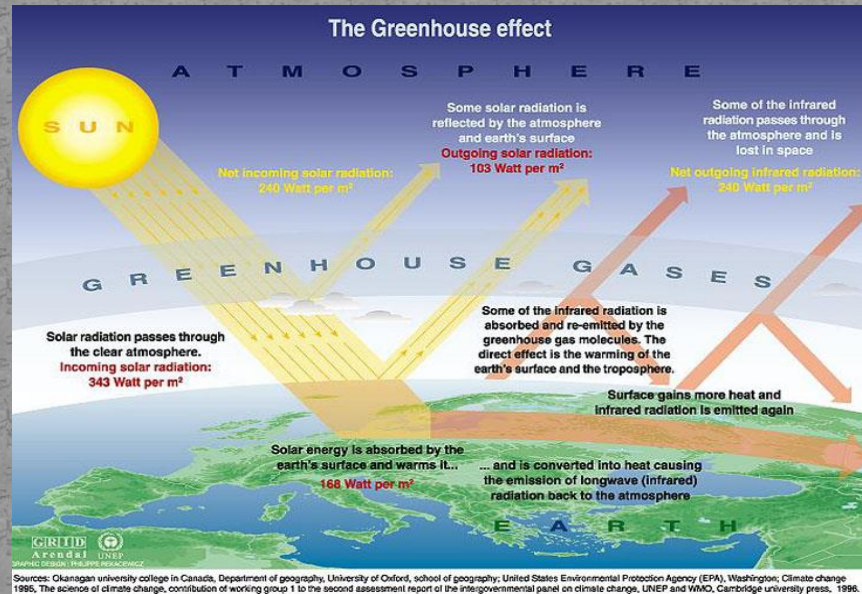
It is the increase of the Earth's average surface temperature due to a build-up of greenhouse gases in the atmosphere.

Q.20. What is climate change ?

is a broader term that refers to long-term changes in climate, including average temperature and precipitation.



- Q.21. What are greenhouse gases and draw diagram to explain greenhouse function of the earth ?
- Greenhouse gases are carbon dioxide, methane, water vapour and nitrox oxide.



- Q.22 What are the causes of ozone depletion ?
- Following are the causes of ozone depletion :
- i) Chlorofluoro carbons (CFC' s) and other halogenated hydrocarbons contribute to the destruction of stratospheric ozone.
- ii) Other harmful compounds include HCFCs, halons, methyl bromide, carbon tetrachloride, NO<sub>2</sub>, and methyl chloroform.
- iii) CFCs are used in refrigerators, home insulation, aerosols, plastic foam, and throwaway food containers.

- Q.23 Why is ozone important ?
- Ozone is important because
  - i) it protects the Earth from ultraviolet rays emitted by the sun.
  - ii) the wavelengths of ultraviolet radiation are absorbed by the ozone molecules.
  - iii) Ozone depletion or ODS is the decay of the protecting ozone layer that filters out harmful UV light. An ozone depleting substance can remain in the stratosphere for long periods, causing holes in the layer and allowing harmful UV rays to reach the earth's surface.

- Q.24. What are the sources of CFCs ?
- Sources of CFCs are air conditioner, refrigerators, body and room spray, paints etc.
- Q.25. Name some of the common problems associated with ozone depletion.
- Some of the common problems are skin burn, skin cancer, blindness, limit the plant growth and cataract.
- Q.26. How to control the ozone depletion ?
- Less or non use of CFCs gases. Use of CFCs free air conditioner, refrigerators, body and room spray, paints.

- Q.27 What is acid rain ?
- Acid rain is basically rain that has a higher than normal acid level (low pH).
- Q.28. How is acid rain produced ?
- Acid gases are produced when fossil fuels like coal and oil are burned in power stations, factories and in our own homes. Most of these acid gases are blown into the sky, and when they mix with the clouds it can cause rain - or snow, sleet, fog, mist or hail - to become more acidic.



- Q.29. Name the gases that cause acid rain?
- Following gases cause acid rains:
- burning coal, oil and natural gas in power stations makes electricity, giving off **sulphur dioxide gas**.
- burning petrol and oil in vehicle engines gives off **nitrogen oxides** as gases.
- These gases mix with water vapour and rainwater in the atmosphere producing weak solutions of sulphuric and nitric acids – which fall as acid rain.

• Q.30. What are the problems associated with acid rain ?

Acid rain is an extremely destructive form of pollution, and the environment suffers from its effects. Forests, trees, lakes, animals, and plants suffer from acid rain. Trees can also suffer from stunted growth; and have damaged bark and leaves, which makes them vulnerable to weather, disease, and insects.

- Soil also gets polluted with acid rains and plants are affected seriously by this.
- Lakes are also damaged by acid rain. Fish die off, and that removes the main source of food for birds. Acid rain can even kill fish before they are born when the eggs are laid and come into contact with the acid.
- Fish usually die only when the acid level of a lake is high; when the acid level is lower, they can become sick, suffer stunted growth, or lose their ability to reproduce.
- Also, birds can die from eating "toxic" fish and insects.

Acid rain dissolves the stonework and mortar of buildings (especially those made out of sandstone or limestone).It reacts with the minerals in the stone to form a powdery substance that can be washed away by rain.

- Acid rain can travel long distances. Often it doesn't fall where the gas is produced. High chimneys disperse (spread) the gases and winds blow them great distances before they dissolve and fall to Earth as rain.



- Q.31. What is biodiversity ?
- Biodiversity is referred to biological diversity i.e. variety of life forms. There are various forms of life on the earth which is called biodiversity.
- Q.32. What are the types of biodiversity ?
- There are three types of biodiversity. They are :
- i) Ecosystem Diversity, ii) Species Diversity and iii) Genetic Diversity.



- Q.32. Define the following terms:
- i) Ecosystem Diversity, ii) Species Diversity and iii) Genetic Diversity.
- **Ecosystem diversity** refers to the diversity of a place at the level of ecosystems. The term differs from biodiversity which refers to variation in species rather than ecosystems. Ecosystem diversity can also refer to the variety of ecosystems present in a biosphere, the variety of species and ecological processes that occur in different physical settings.
- **Genetic diversity**, the level of biodiversity, refers to the total number of genetic characteristics in the genetic makeup of a species. It is distinguished from genetic variability, which describes the tendency of genetic characteristics to vary.
- 
- **Species diversity** is the effective number of different species that are represented in a collection of individuals (a dataset). The effective number of species refers to the number of equally-abundant species needed to obtain the same mean proportional species abundance as that observed in the dataset of interest (where all species may not be equally abundant). Species diversity consists of two components, species richness and species evenness.

- Q.33. What are the threats to biodiversity ?
- Biological diversity is under threat. These threat come from man in various ways. These are:
  - i) HABITAT DESTRUCTION: Deforestation, Land Reclamation etc.
  - ii) POLLUTION: Land, Air, Water by man through his activities.
  - iii) GLOBAL CLIMATE CHANGE: Variation in Temperature, Rainfall etc.
  - iv) EXPLOITATION:
  - v) SPECIES INTRODUCTION: Introduction of non-native plants e.g. TEA in India, has destroyed native vegetation in tea growing areas.

- Q.34. What CRZ stands for?
- CRZ stands Coastal Regulations Zone.
- Q.35. What is the definition of CRZ ?
- The coastal zone is defined as an area from the territorial waters limit (12 nautical miles) including its sea bed upto the landward boundary of the local self government abutting the sea coast.

- Q.36 Name some prohibited activities in the CRZ ?
- Certain activities are prohibited in CRZ, these are:
- 1) No new construction of buildings shall be permitted within 200m of HTL.
- 2. Corals and sand from the beaches and coastal waters shall not be used for construction and purposes.
- 3. Construction activities in ecologically sensitive areas
- 4. Dredging and underwater blasting in and around coral formations shall not be permitted.
-



- 5. Land reclamation, building or disturbing the natural course of sea water with similar observations, except those required for control of coastal erosion and maintenance or sandbars except tidal regulators, storm water recharge.
- 6. Mining of sand, rocks and other substrata materials not available outside CRZ areas.
- 7. Any construction between LTL and HTL except facilities for carrying treated effluents and waste discharges, oil, gas and similar pipelines and dressing or altering of sand dunes, hills natural features including landscape changes for beautification, recreational and other such purposes.

- Q.37. Are following statements TRUE or FALSE? If FALSE, write the correct statement.
- i) Food chain and food web both exist in the ecosystem.
- **FALSE.** Only food web exist in the ecosystem.
- ii) Biodiversity is found everywhere in the world.
- **FALSE.** Biodiversity is found only in certain places in the world.
- iii) Ozone is affected by chlorofluorocarbons.
- **TRUE.**
- iv) Energy can be created.
- **FALSE.** Energy cannot be created.

- v) Plants can only carryout photosynthesis.

FALSE. About 99.99% of photosynthesis is produced by plants. Some micro organisms like **blue algae** can also carryout photosynthesis.

vi) Sun is the one and only source of energy to the earth.

TRUE.

### **Q.38. Fill in the blanks:**

i) On an average \_\_\_\_\_% of light energy is received by the earth.

45%

ii) \_\_\_\_\_ light is most important to the earth.

WHITE



- iii) Herbivores are also known as \_\_\_\_\_.

(Secondary consumers/tertiary consumers)

- iv) \_\_\_\_\_ are animals which can eat both plants and animals.

( carnivores/ herbivores/ omnivores)

- v) \_\_\_\_\_ is one cause of threat to biodiversity.

( Habitat destruction/Fishing/Construction of building)

- vi) Acid rain is common in \_\_\_\_\_.( India/

Australia/Pakistan/Europe).



## MATCH THE COLUMN

### A

- 
- 1. Environment
- 2. Human settlement
- 3. CFCs
- 4. Methane
- 5. Runoff
- 6. Lion
- 7. Detritivores
- 8. Power Industry
- 9. Carbon dioxide
- 10. Forest
- 11. Pollution

### B

- 
- A) Global Warming
- B) Greenhouse gas
- C) Decomposers
- D) Physical environment
- E) Threat to biodiversity
- F) Cultural environment
- G) Ozone depletion
- H) Top carnivore
- I) Secondary consumer
- J) Water cycle
- K) Dynamic system
- L) Acid rain

### B

- 
- K) Dynamic system
- F) Cultural environment
- G) Ozone depletion
- B) Greenhouse gas
- J) Water cycle
- H) Top carnivore
- C) Decomposers
- L) Acid rain
- A) Global Warming
- D) Physical environment
- E) Threat to biodiversity