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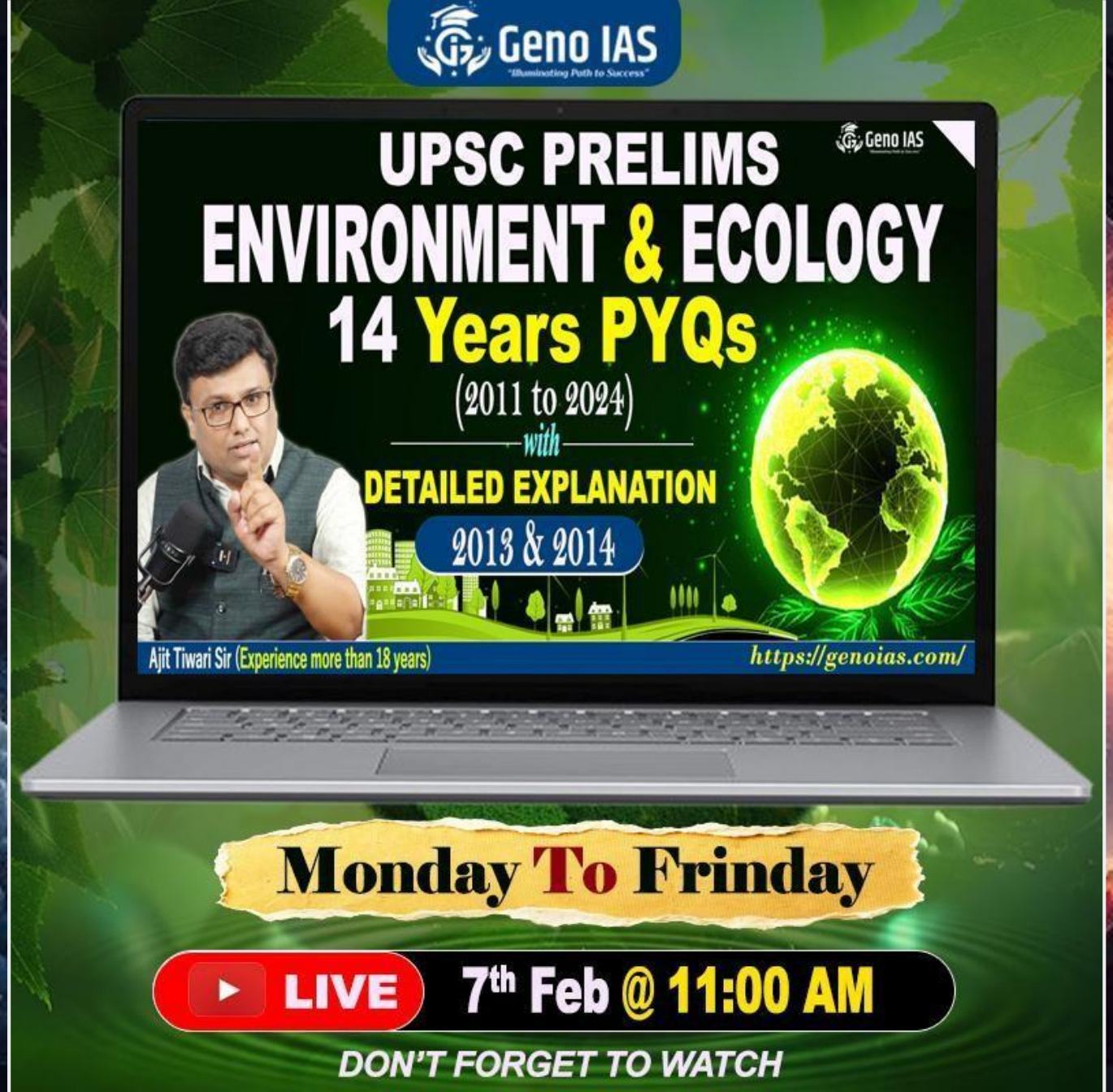

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Q31. Acid rain is caused by the pollution of environment by:

Natural Causes

a) Carbon dioxide and nitrogen

b) Carbon monoxide and carbon dioxide

c) Ozone and carbon dioxide

d) Nitrous oxide and sulphur dioxide

Anthropogenic Causes

Expected Questions

SO_x + NO_x + HCl + Dilute carbonic acid

31. Solution (d)

- Nitrogen oxides and Sulphur dioxides pollutants are primarily responsible for Acid rain characterized with pH value of 5.8 or less.
- Acid rain is caused by a chemical reaction that begins when compounds like sulfur dioxide and nitrogen oxides are released into the air.
- These substances can rise very high into the atmosphere, where they mix and react with water, oxygen, and other chemicals to form more acidic pollutants, known as acid rain.

KNOWLEDGE BASE: ACID RAIN

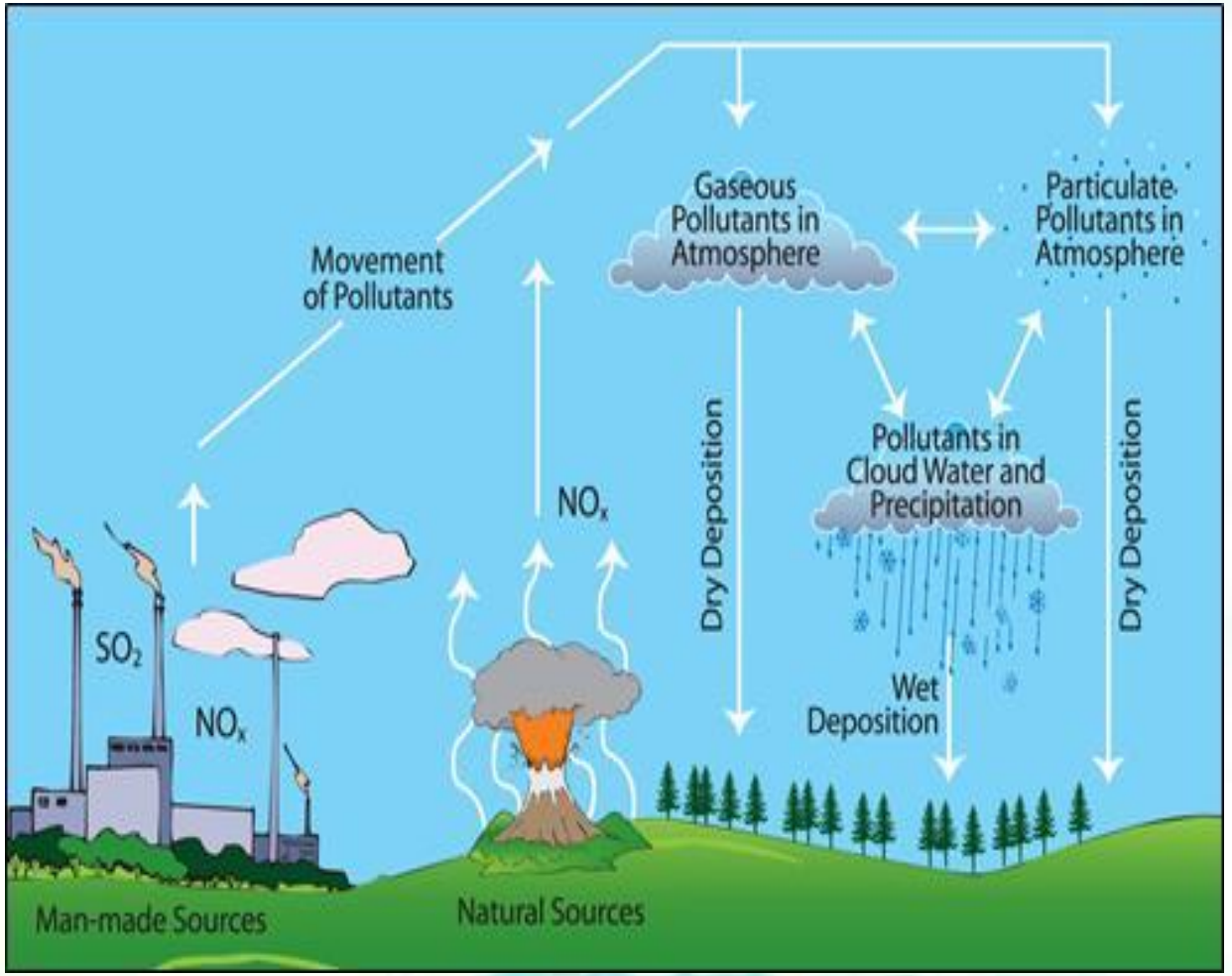
- The acid rain is a form of precipitation which may be fog or snow in which excessive acid like sulphuric or nitric acids are present.
- The rainwater with a PH of less than 5.5 is called acid rain.
- It can be harmful to plants, aquatic animals and human beings.
- The two gases which are mainly responsible for causing acid rain are – Oxides of Sulphur (SO_2) and Oxides of Nitrogen (NO_2).

COMPONENTS OF ACID RAIN

- When ,SO_2 and NO_2 present in excess amounts in the atmosphere mixes or reacts with rainwater, they form sulphuric acid and nitric acid, respectively.
- These acids decrease the PH value of rain to less than 5.5 and make it acidic.
- While a small portion of the SO_2 and NOX that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels.

- The major sources of SO_2 and NOX in the atmosphere are:
- Burning of fossil fuels to generate electricity.
- Two thirds of SO_2 and one fourth of NOX in the atmosphere come from electric power generators.
- Vehicles and heavy equipment.
- Manufacturing, oil refineries and other industries.

- Winds can blow SO_2 and NOX over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.



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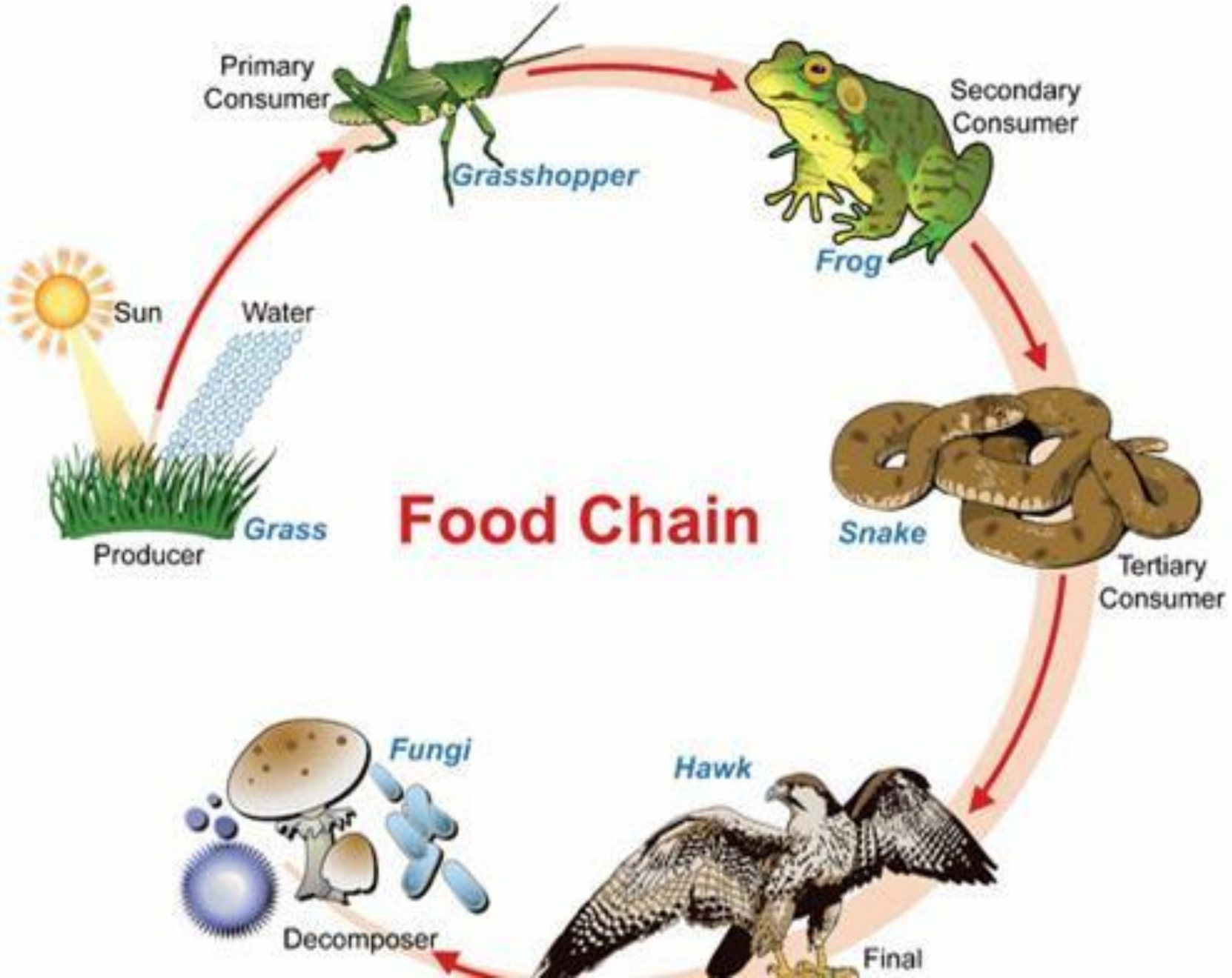
Q32. With reference to food chains in ecosystems, consider the following statements:

1. A food chain illustrates the order in which a chain of organisms feed upon each other.
2. Food chains are found within the populations of a species.
3. A food chain illustrates the numbers of each organism which are eaten by others.

Which of the statements given above is / are correct?

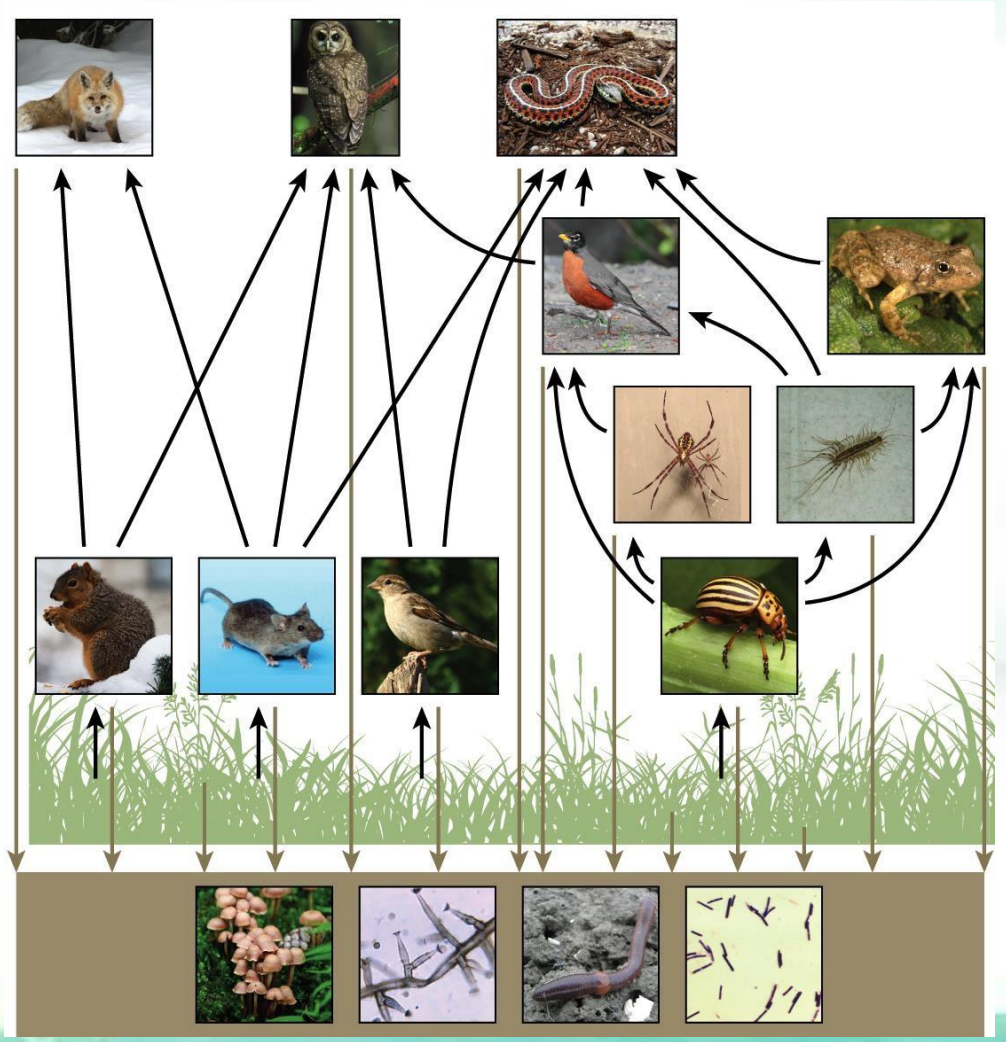
a) 1 only
b) 1 and 2 only
c) 1, 2 and 3
d) None


Grazing Food Chain
Owl
(consumer)
Flower
(producer)
Caterpillar
(consumer)
Frog
(consumer)
Snake
(consumer)


Primary Consumer
Grasshopper
Secondary Consumer
Frog
Sun
Water
Grass
Producer
Food Chain
Snake
Tertiary Consumer
Fungi
Hawk
Decomposer
Final

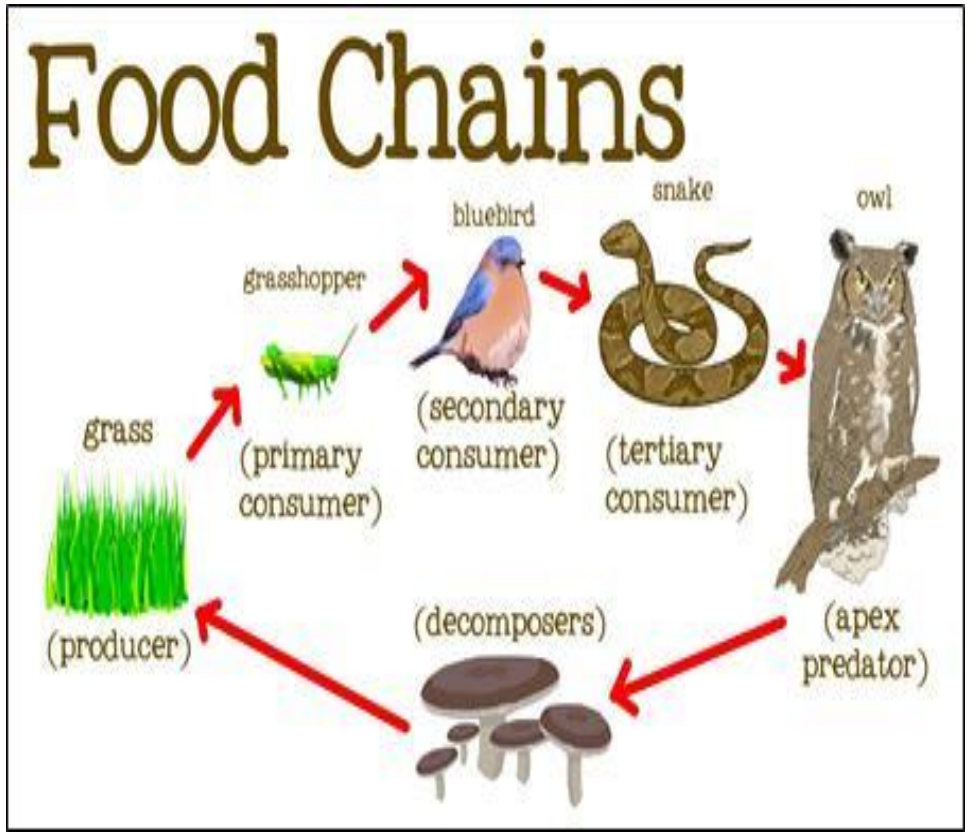
32. Solution (a)

- A food chain illustrates the order in which a chain of organisms feed upon each other.
- A food chain can be found where two or more than two populations of species are involved.
- A food chain does not indicate the number of organisms which are eaten by others.



KNOWLEDGE BASE

- Food chain refers to a linked feeding series in an ecosystem.
- A food chain illustrates the order in which a chain of organisms feed upon each other and the sequence of organisms through which energy and materials are transferred, in the form of food, from one trophic level to another.
- The following graphics show a simple food chain.
- The food chains are not isolated and are interlinked to each other.
- For example, a Hawk can eat snakes as well as other smaller birds.
- A mouse can eat grass, bread or even grasshoppers.
- A Lizard can eat insects of different types.



- Thus, various food chains are intertwined in each other making a food web.
- A Food Web is thus a system of interlocking and interdependent food chains.
- A typical Food Web is shown in the below graphics.

Q33. Consider the following organisms:

1. Agaricus – Fungi
2. Nostoc – Cyanobacteria / BGA / Blue Green algae – Anaebaena – Free living
3. Spirogyra – ~~Green algae~~

Which of the above is / are used as biofertilizer / biofertilizers:

a) 1 and 2

b) 2 only

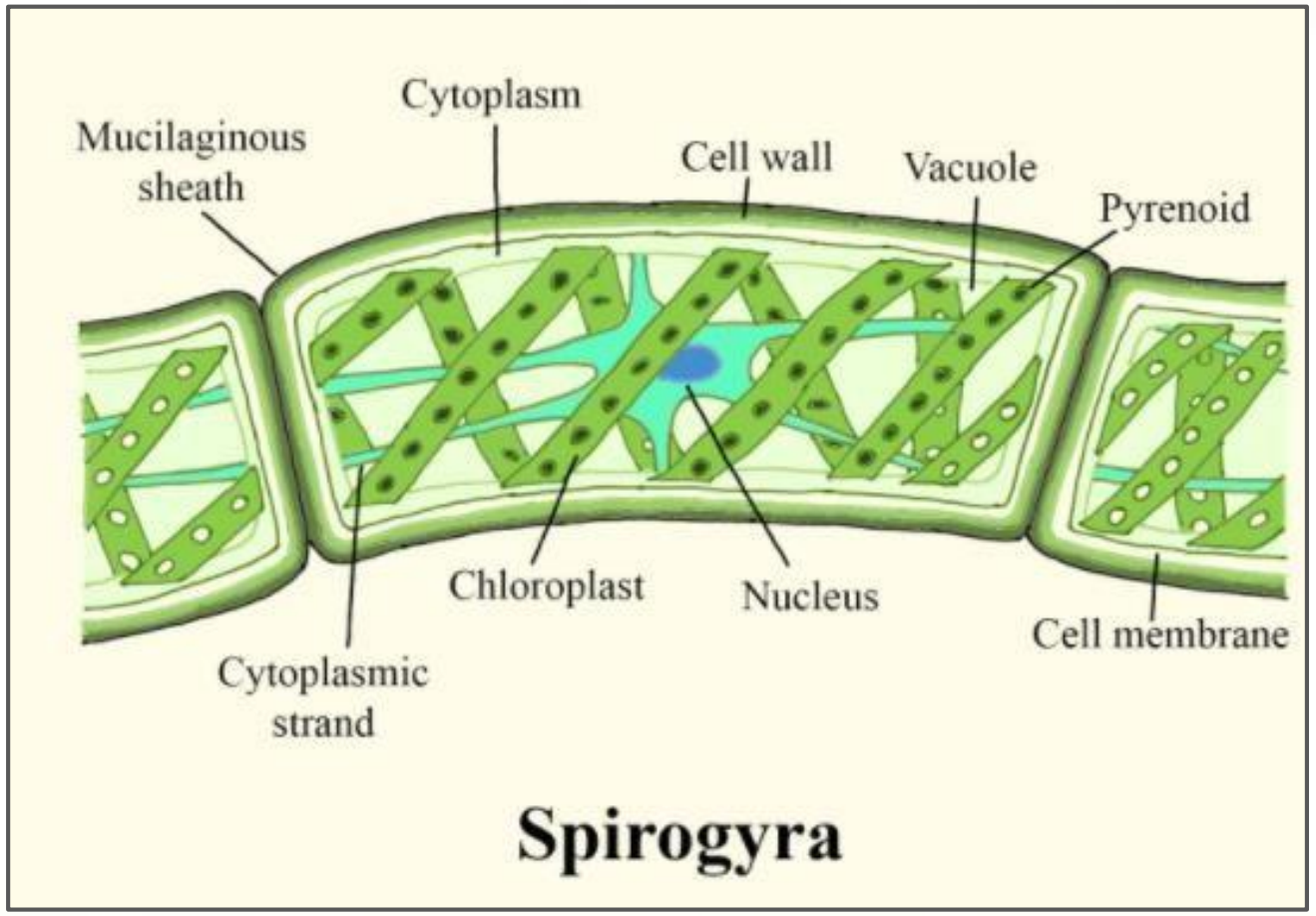
c) 2 and 3

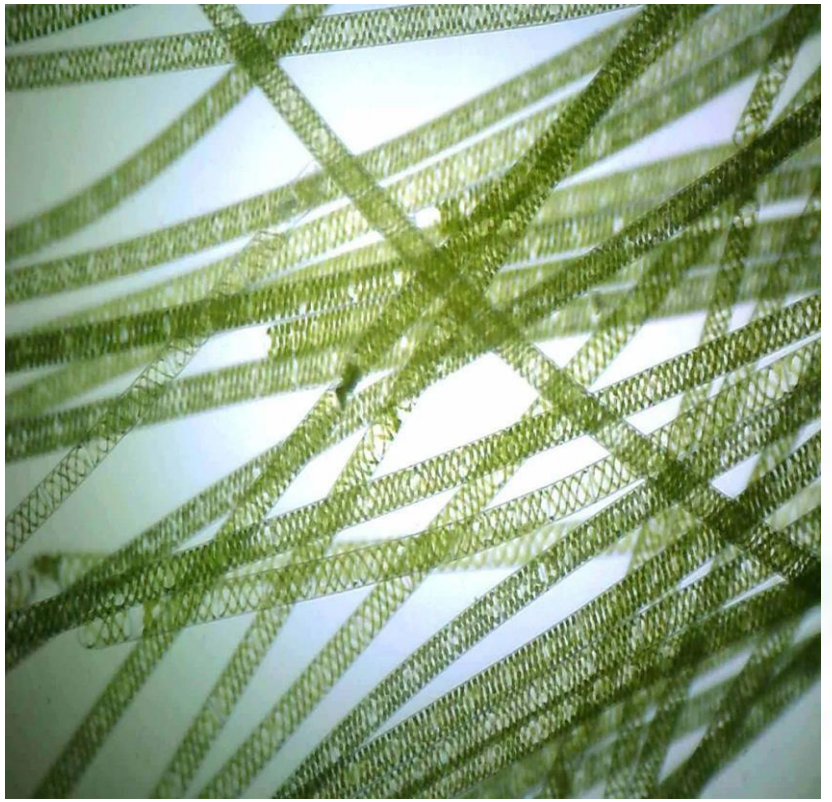
d) 3 only

Living microorganism ↓ available

Agaricus

Nostoc


Mucilaginous sheath
Cytoplasm
Cell wall
Vacuole
Pyrenoid
Chloroplast
Nucleus
Cytoplasmic strand
Cell membrane
Spirogyra



33. Solution (b)

- Biofertilizers is a substance which contains living microorganisms which when applied to seed, plant surface, or soil, colonizes the rhizosphere or the interior of a plant and promotes growth by increasing the supply of nutrients to host plants.
- Blue green algae (BGA or cyanobacteria) like Nostoc and Anabaena are free living photosynthetic organisms also capable of fixing atmospheric nitrogen.
- It's used as food and medicine. Agaricus mushroom might strengthen the immune system, fight tumor growth, and work as an antioxidant.

- People use agaricus mushroom for hay fever, cancer, heart disease, diabetes, and many other conditions, but there is no good scientific evidence to support these uses.
- Spirogyra is a green algae that has many uses, including as a food source, in bioremediation, and as a potential biofuel.
- The filamentous algae genus Spirogyra owes its name to the characteristic spiral shape of the chloroplasts possessed by its members. Sometimes alternatively known as water-silk, mermaid's tresses, or pond scum, a large presence of the unbranched algae often indicates the nutrient enrichment of freshwater bodies.

Food source

- Spirogyra is a source of vitamin A and calcium, and is eaten in some Asian countries
- It is rich in vitamins and minerals

Bioremediation

- Spirogyra can help reduce toxic runoff from mines and municipal wastewater
- It can be used to treat municipal wastewater and produce biomass for biofuel

Biofuel

- Spirogyra can be used as a potential biofuel
- Some studies have investigated the use of Spirogyra biomass as a feedstock for bioethanol

Pharmaceuticals

- Spirogyra contains bioactive compounds that can be used for antibiotics, antioxidants, and anti-inflammatories
- Some species of Spirogyra have been investigated for their potential to treat diabetes and cancer

Aquatic ecosystems

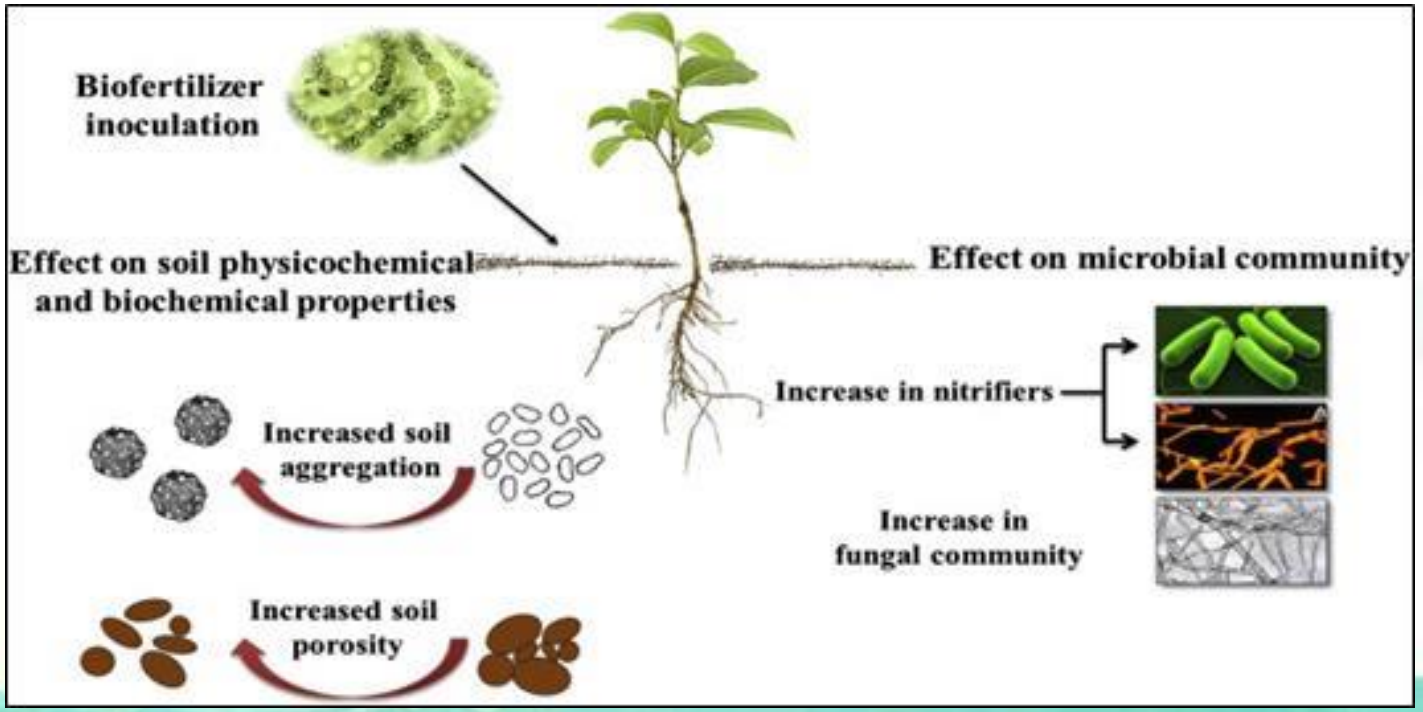
- Spirogyra is photosynthetic, which means it provides oxygen to other organisms in the water

BIOFERTILIZERS

- There are five biofertilizers viz.
- Rhizobium, Azotobacter, Azospirillum, Phosphate Solubilizing Bacteria and mycorrhiza, which have been incorporated in India’s Fertilizer Control Order (FCO), 1985.
- Rhizobium, Azotobacter, Azospirillum and blue green algae (BGA) have been traditionally used as Biofertilizers.
- Rhizobium inoculant is used for leguminous crops such as pulses.

- Azotobacter can be used with crops like wheat, maize, mustard, cotton, potato and other vegetable crops.
- Blue green algae such as Nostoc, Anabaena, Tolypothrix and Aulosira fix atmospheric nitrogen and are used as inoculants for paddy crop.

- Phosphate solubilizing bacteria like Pantoea agglomerans strain P5, and Pseudomonas putida strain P13 are able to make the phosphate usable by solubilizing it from inorganic sources.



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Q34. Which one of the following terms describes not only the physical space occupied by an organism, but also its functional role in the community of organisms?

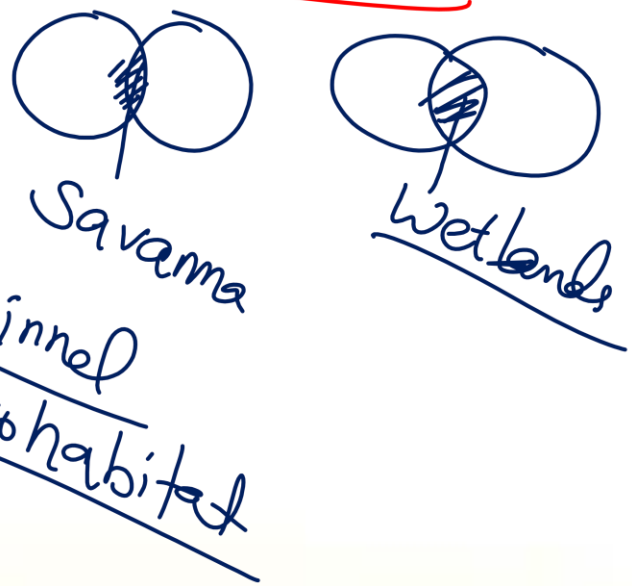
Expected Questions

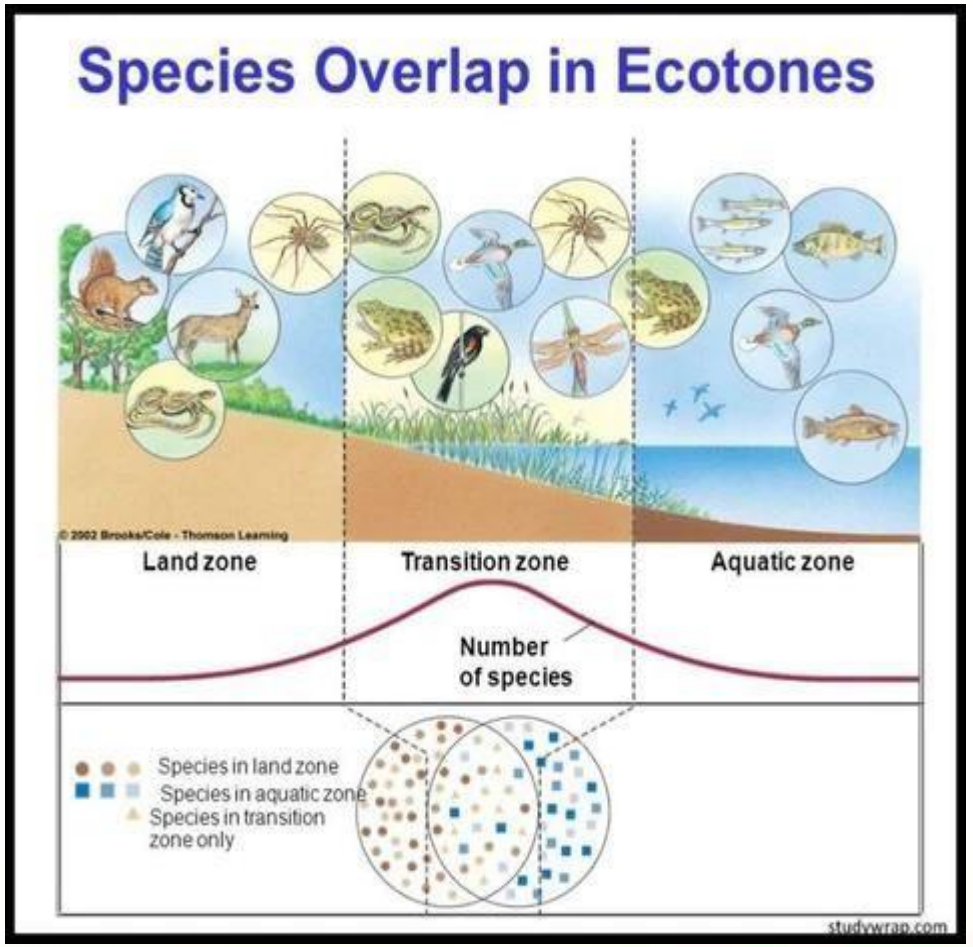
a) Ecotone ✗

b) Ecological niche ✓

c) Habitat ✗

d) Home range ✗





Ecological Niche

- The **ecological niche** describes the functional position of an organism in its environment.
- A niche comprises:
  - the **habitat** in which the organism lives.
  - the organism's **activity pattern**: the periods of time during which it is active.
  - the **resources** it obtains from the habitat.

34. Solution (b)

Ecotone

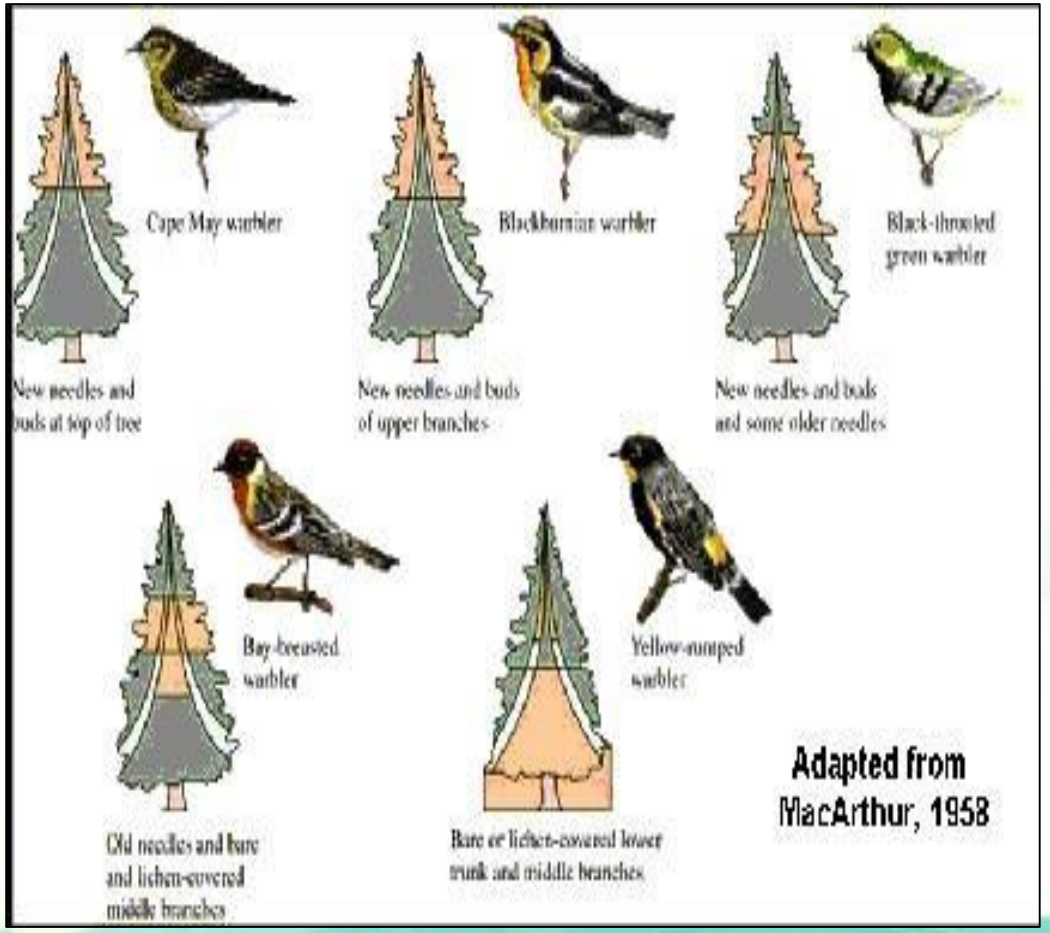
- An ecotone is a zone of junction or a transition area between two biomes (diverse ecosystems).
- Ecotone is the zone where two communities meet and integrate.
- For e.g. the mangrove forests represent an ecotone between marine and terrestrial ecosystems.

- Other examples are grassland (between forest and desert), estuary (between freshwater and saltwater) and riverbank or marshland (between dry and wet).

Ecological Niche

- An ecological niche is the role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces.
- A species' niche includes all of its interactions with the biotic and abiotic factors of its environment.
- Biotic factors are living things, while abiotic factors are nonliving things.

- It is advantageous for a species to occupy a unique niche in an ecosystem because it reduces the amount of competition for resources that species will encounter.



HABITAT

- A habitat is a place or area where a species grows, lives or thrives. Temperature, sunlight, rainfall, types of soil, etc. and other abiotic factors determine the presence of organisms present in an area. These factors prevailing in an area determine the best-suited species for that environment.
- Habitat is the best-suited condition for a species and provides ideal conditions for a species to grow, adapt, reproduce and flourish.
- It is the energy or nutrient providing area for an organism. Habitat of a species describes the totality of abiotic factors to which the species is exposed in the area.
- Examples of habitat include desert, ponds, freshwater lake, ocean, mountains, grassland, forest, etc.

HOME RANGE

- The home range of an animal is the area where it spends its time; it is the region that encompasses all the resources the animal requires to survive and reproduce.
- Competition for food and other resources influences how animals are distributed in space.
- Even when animals do not interact, clumped resources may cause individuals to aggregate.
- For example, clumping may occur if individuals settle in an area one by one.

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Q35. Photochemical smog is a resultant of the reaction among:

PCS / Los Angeles / oxidising smog

a) NO_2, O_3 and peroxyacetyl nitrate in the presence of sunlight

b) CO, O_2 and peroxyacetyl nitrate in the presence of sunlight

c) CO, CO_2 and NO_2 at low temperature

d) High concentration of NO_2, O_3 and CO in the evening

PCS = NO_x + PAN + PBN + H_2O_2 + ($-O_3$) + Aldehydes + VOCs

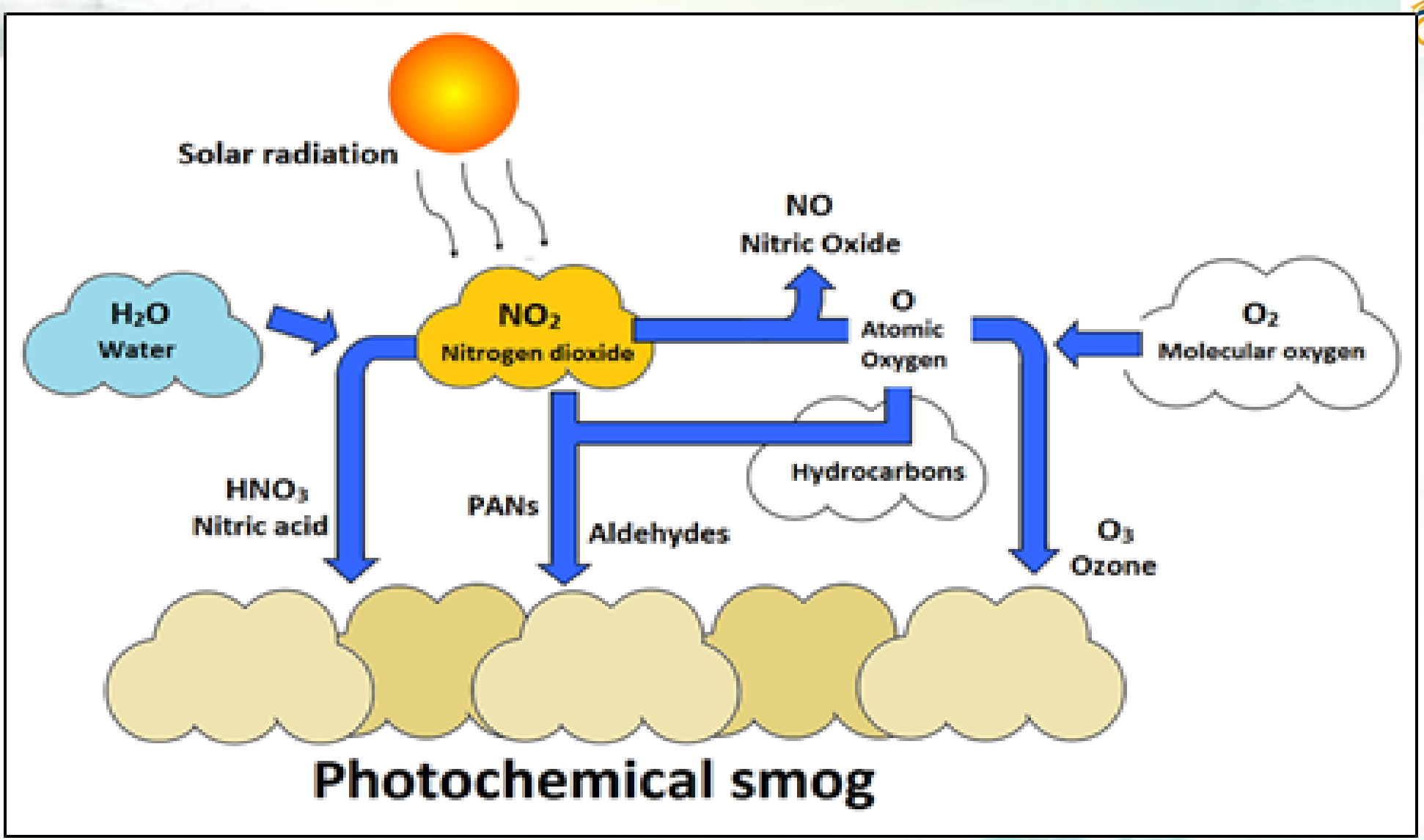
Summer, Noon, Intense light

35. Solution (a)

Photochemical Smog:

- Photochemical smog was first described in the 1950s.
- It is the chemical reaction of sunlight, nitrogen oxides and volatile organic compounds in the atmosphere, which leaves airborne particles and ground level ozone.
- This noxious mixture of air pollutants can include the following:
  - ➢ Aldehydes
  - ➢ Nitrogen oxides, such as nitrogen dioxide
  - ➢ Peroxyacyl nitrates
  - ➢ Tropospheric ozone
  - ➢ Volatile organic compounds

- All of these harsh chemicals are usually highly reactive and oxidizing.
- Photochemical smog is therefore considered to be a problem of modern industrialization.
- It is present in all modern cities, but it is more common in cities with sunny weather. warm, dry climates and a large number of motor vehicles.
- Because it travels with the wind, it can affect sparsely populated areas as well.


Solar radiation
NO
Nitric Oxide
H_2O
Water
NO_2
Nitrogen dioxide
O
Atomic
Oxygen
O_2
Molecular oxygen
Hydrocarbons
HNO_3
Nitric acid
PANs
Aldehydes
O_3
Ozone
Photochemical smog

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Q36. With reference to the food chains in ecosystems, which of the following kinds of organisms is / are known as decomposer organism/organisms?

1. Virus — Living / Non Living
2. Fungi
3. Bacteria

Select the correct answer using the codes given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

36. Solution (b)

Producers, consumers and Decomposers

- In terms of nutrition, that all organisms within a community are either producers, or consumers or decomposers.
- The producers or autotrophs are the plants which make their own food from inorganic raw material.
- This work is accomplished via photosynthesis or chemosynthesis.
- Consumers or heterotrophs get their nutrition / energy from the things they consume.
- They cannot produce their own food and have to look outside the world for those things to consume.

Examples of decomposers

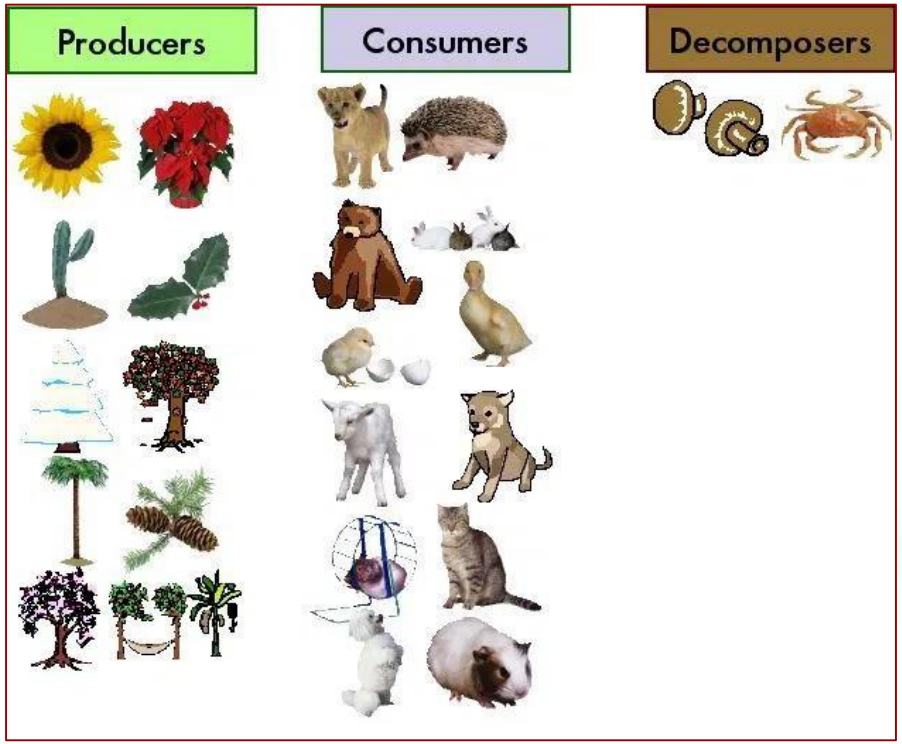
worms

mushrooms

bacteria

sowbugs

- All organisms finally yield to decomposers, which break down organic matter into simple products.
- Fungi and bacteria are the common decomposers.
- They serve as the “garbage collectors” or “recyclers” in our environment.



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