

CHAPTER 15

OUR ENVIRONMENT

Syllabus

Ecosystem, Environmental problems, ozone depletion, waste production and their solution, biodegradable and non-biodegradable substances.

Trend Analysis

List of Concepts	2018	2019	2020
	OD	OD/D	OD
Ecosystem, Food chain, Ten percent energy law			1 Q (3 M)
Biodegradable and non-biodegradable substances, Global warming, Ozone depletion, Waste disposal	1 Q (3 M)	1 Q (3 M)	1 Q (1 M) Or 1 Q (3 M)



TOPIC - 1

Ecosystem and Food Chain



Revision Notes

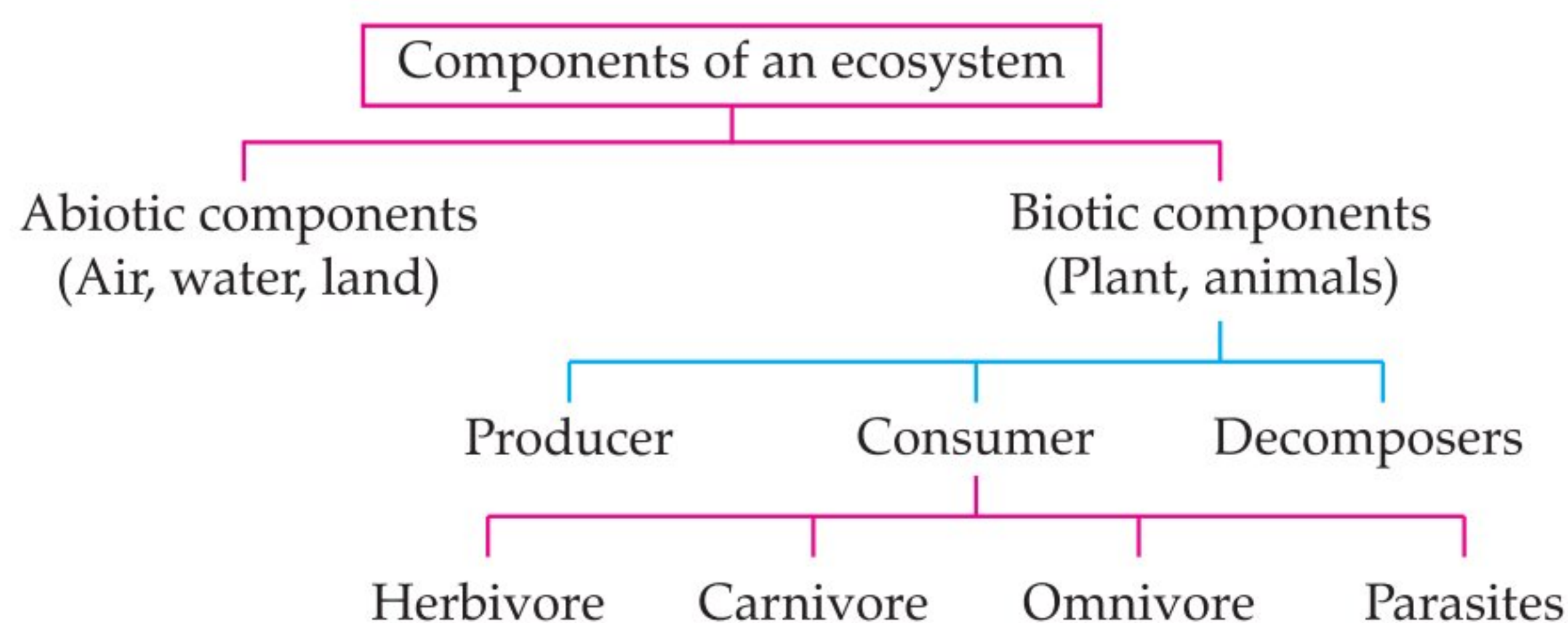
- Everything that surrounds us is environment. It includes both living (biotic) and non-living (abiotic) components.
- Interaction between these biotic and abiotic components forms an ecosystem.
- In an ecosystem, living components depend on each other for their food which gives rise to food chains and food webs in nature.
- Human activities lead to environmental problems such as depletion of ozone layer and production of huge amount of garbage.
- **Ecosystem:** All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. *e.g.*, forest, pond etc.
- **Types of Ecosystem:** It is of two types:
 - (a) **Natural Ecosystem:** The ecosystem which exists in nature on its own. *e.g.*, forest, lake, ocean, etc.
 - (b) **Artificial Ecosystem:** Man-made ecosystem is called *artificial ecosystem*. *e.g.*, crop field, aquarium, garden, etc.

TOPIC - 1

Ecosystem and Food Chain

TOPIC - 2

Biodegradable and Non-Biodegradable Substances and Global Warming



- Herbivores, carnivores, omnivores and parasites are the various type of consumers.
- **Consumers** are those organisms which depend upon the producers for food, either directly or indirectly by feeding on other consumers for their sustenance. They are also called *heterotrophs*.
- **Parasites** are those organisms that live outside (ectoparasites) or inside (endoparasites) the body of another organisms, *i.e.*, host *e.g.*, parasites of human include fleas and lice.
- **Decomposers** are those micro-organisms that obtain energy from the chemical break down of dead organisms or animals or plant wastes. Decomposers break down the complex organic substances into simple inorganic substances that go into the soil and are used up again by the plants.
- Food chain is the sequence of organisms through which food energy flows in an ecosystem. It is a succession of organisms that eat other organisms and may, in turn, be eaten themselves. **Examples:**
 Grass → Grasshopper → Frog → Snake → Eagle
 (Producer) (Herbivore) (Carnivore) (Carnivore) (Top Carnivore)
- **Trophic Levels** are the various steps or levels in the food chain where transfer of food or energy takes place. Producers are the first trophic level, herbivores are the second trophic level, carnivores or secondary consumers are the third trophic level and large carnivores or tertiary consumers are the fourth trophic level.
- **Food Web** is the network of various food chains which are interconnected at various trophic levels. Since an organism can occupy position in more than one food chain, in a food web it occupies more than one trophic level. It represents the feeding relationship within the community.
- **Energy Flow:** The flow of energy through different steps in the food chain is unidirectional. This means that the energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs.
- **10 Percent Law:** It states that only 10 per cent of food energy is transferred from one trophic level to the next level. The remaining 90 per cent energy is used in life processes (digestion, growth, reproduction, etc.) by the present trophic level.
- Due to this gradual decrease in energy, food chains contain 3 - 4 trophic levels.
- **Biological Magnification:** The concentration of harmful chemicals goes on increasing with every next trophic level in a food chain. This is called as *biological magnification*.
- Maximum concentration of such chemicals get accumulated in human bodies as human occupy the top level in any food chain.



Mnemonics

Concept: Major components of environment

Mnemonics: **WASAP**

Interpretation:

W - Water

A - Air

S - Soil

A - Animals

P - Plants

Explanation : Food chain (ii): It is an aquatic food chain so grasshopper cannot be a part of it.

In food chain (iii): Wolf, snake and tiger, all are carnivores. There are no herbivores to eat grass therefore grass cannot be a part of food chain (iii).

Q. 5. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about :

- (a) 1%. (b) 5%.
(c) 8%. (d) 10%.

[NCERT Exemp.]

Ans. Correct option : (a)

Explanation : Green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on the leaves and converts it into food energy.

Q. 6. Select the mismatched pair in the following and correct it.

- (a) Bio-magnification — Accumulation of chemicals at the successive trophic levels of a food chain
(b) Ecosystem — Biotic components of environment
(c) Aquarium — A man-made ecosystem
(d) Parasites — Organisms which obtain food from other living organisms

[NCERT Exemp.]

Ans. Correct option: (b)

Explanation : Both biotic and abiotic components of environment constitute an ecosystem.

B Assertions and Reasons Type Questions

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Q. 1. Assertion: Food chain is responsible for the entry of harmful chemicals in our bodies.

Reason: The length and complexity of food chains vary greatly. [A] [CBSE SQP, 2020]

Ans. Correct option : (b) 1

Q. 2. Assertion: Greater number of individuals are present in lower trophic levels.

Reason: The flow of energy is unidirectional. [CBSE SQP, 2020]

Ans. Correct option : (b) 1

Q. 3. Assertion (A): Herbivores are called first order consumers.

Reason (R): Tiger is a top carnivore.

Ans. Correct option : (b)

Explanation : Herbivores obtain their food from plants. Hence, are known as *first order carnivores*. The carnivores like tiger that cannot be preyed

upon further, lie at the top of food chain and hence termed as top carnivores. 1

Q. 4. Assertion (A): Flow of energy in a food chain is unidirectional.

Reason (R): Energy captured by autotrophs does not revert back to the solar input and it passes to the herbivores.

Ans. Correct option : (a)

Explanation : The flow of energy through different steps in the food chain is unidirectional. This means that energy captured by autotrophs does not revert back to the solar input and it passes to the herbivores.

Q. 5. Assertion (A): First trophic level in a food chain is always a green plant.

Reason (R): Green plants are called producers.

Ans. Correct option : (a)

Explanation : Green plants are producers. The first trophic level in a food chain is the producers i.e. those organisms which produce food by photosynthesis.

Q. 6. Assertion (A): Decomposers keep the environment clean.

Reason (R): They recycle matter by breaking down the organic remains and waste products of plants and animals.

Ans. Correct option : (a)

Explanation : Decomposers keep the environment clean by decomposing or consuming the dead remains of other organisms.

Q. 7. Assertion (A): The concentration of harmful chemicals is more in human beings.

Reason (R): Man is at the apex of the food chain.

Ans. Correct option: (a)

Explanation : Harmful chemicals accumulate progressively at each trophic level. Since the man is at the apex of all the food chains, the concentration of harmful chemicals may be more in human beings. The phenomenon involved is known as biomagnification.

C Very Short Answer Type Questions

[AI] Q. 1. Give reason why a food chain cannot have more than four trophic levels. [A] [Board SQP, 2020]

Ans. The loss of energy at each step is so great that very little usable energy remains after four trophic levels. 1

Q. 2. What is ecosystem? [R] [Delhi Set 31/1/1 2017]

Ans. Ecosystem is the functional unit of the environment comprising of the living and non-living components. [CBSE Marking Scheme, 2017] 1

[AI] Q. 3. List two man-made ecosystems.

[R] [Foreign Set 2017]

[Board Term II, 2012]

Ans. Garden and pond. $\frac{1}{2} + \frac{1}{2}$

Q. 4. List two biotic components of an ecosystem .

[R] [OD Comptt. 2017]

Ans. Plants, animals, micro-organisms. (Any two) $\frac{1}{2} + \frac{1}{2}$
[CBSE Marking Scheme, 2017]

COMMONLY MADE ERROR

- Students start explaining biotic components instead of just giving the example.

ANSWERING TIP

- Comprehend what is being asked before answering by reading the question carefully. Don't waste time in elaborating the answer.

AI Q. 7. In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer? [A] [CBSE, OD, Set-1, 2017]

Plants \longrightarrow Deer \longrightarrow Lion

Ans. Plants are producers. So, energy available to the producer is 10,000 J.

[CBSE Marking Scheme, 2017] 1

OR



Topper Answer, 2017

Energy available to producer $\rightarrow 10,000$ J

COMMONLY MADE ERROR

- Commonly made error: Students often write vague answer. It seems they are unaware of ten percent law.

ANSWERING TIP

- Learn laws, principles and key-words/acronyms with proper understanding. Remember 10 percent law of energy transfer.

Q. 8. In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes? [A] [OD 31/2 2017]

Plants \longrightarrow Rats \longrightarrow Snakes \longrightarrow Hawks

$$\text{Ans. Snakes} = 500 \times \frac{10}{100} = 50 \text{ J}$$

$$\text{Hawks} = 50 \times \frac{10}{100} = 5 \text{ J}$$

Q. 12. In a food chain of frog, grass, insect and snake assign trophic level to frog.

[A] [Board Term II, O.D. Set III, 2016]

Ans. Grass \longrightarrow Insect \longrightarrow Frog \longrightarrow Snake

Frog is 3rd trophic level.

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

AI Q. 5. Why is forest considered as a natural ecosystem? [U] [Delhi 31/1/2 2017]

Ans. A forest ecosystem is a natural woodland unit consisting of all plants, animals and micro-organisms, in an area functioning together with all of the non-living physical factors of the environment. 1

Q. 6. Why is a lake considered to be a natural ecosystem? [U] [Delhi 31/1/3 2017]

Ans. Because a lake is a self-sustaining system. 1
[CBSE Marking Scheme, 2017]

(According to 10 percent Law) $\frac{1}{2} + \frac{1}{2}$

Q. 9. List two natural ecosystems.

[R] [Board Term II, Delhi Set I, 2016]

Ans. Natural ecosystem—Forest/Lake/Pond/River.

(Any two) $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Q. 10. We often use the word environment. What does it mean? [C] [Board Term II, Foreign I, 2016]

Ans. Environment is everything that surrounds us. It is the physical, chemical and biological conditions of the region. [CBSE Marking Scheme, 2016] 1

Q. 11. Why do producers always occupy the first trophic level on every food chain?

[AE] [Board Term II, Foreign Set II, 2016]

Ans. Because producers (plants) have the ability to trap solar energy with the help of chlorophyll.

[CBSE Marking Scheme, 2016] 1

OR



Topper Answer, 2016

Grass → insect → frog → Snake.
Frog comes in the third trophic level.

COMMONLY MADE ERROR

- ➔ Student are unaware of the concept of trophic level. So they write vague answer.

ANSWERING TIP

- ➔ Lay stress on understanding the concept instead of rote learning.

AI Q. 13. The first trophic level in a food chain is always a green plant. Why?

C [Board Term II, O.D. Set II, 2015]

Ans. Green plants are producers. The first trophic level in a food chain is producer *i.e.* those organisms which produce food by photosynthesis. 1

[CBSE Marking Scheme, 2015]

Q. 14. The following organisms form a food chain. Which of these will have the highest concentration of non- biodegradable chemicals?

Name the phenomenon associated with it: Insects, Hawk, Grass, Snake, Frog.

A [Board Term II, Foreign Set I, 2015]

Ans. Hawk.

Biomagnification.

$\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2015]

COMMONLY MADE ERROR

- ➔ Students forget to write the name of the phenomenon. It seems they are not aware of this technical term.

ANSWERING TIP

- ➔ Always use biological/technical terms rather than common names. Use correct spelling of biological terms.
- ➔ Learn the concept of biomagnification with the help of proper example.



Short Answer Type Questions-I

2 marks each

AI Q. 1. Why must we conserve our forests? List two factors responsible for causing deforestation.

A [OD 31/2 2017]

Ans. Forests help in preventing soil erosion / protect biodiversity / maintain ground water level / help in rainfall / provide raw materials / prevent floods / (any other two points). $\frac{1}{2} + \frac{1}{2}$

Exploitation by industries / increase in population / urbanization / cattle grazing / (any other two points) [CBSE Marking Scheme, 2017] $\frac{1}{2} + \frac{1}{2}$

Q. 2. State two advantages of conserving (i) forests and (ii) wildlife.

A [OD 31/1/ 2017]

Ans. Conserving forests helps in (i) retaining sub soil water and (ii) checking floods/ any other 1
Conserving wild life helps in (i) maintaining ecological balance and (ii) protecting the nature (or any other) $\frac{1}{2} \times 4$ [CBSE Marking Scheme, 2017]

Detailed Answer:

Two advantages of conserving forests are:

- (i) Forests maintain balance between abiotic and biotic factors of the environment.

(ii) They provide us various products in the form of food, medicines, wood and raw materials for different industries. 1

Advantages of conserving wildlife are ;

- (i) For protecting biodiversity.
- (ii) Some wildlife of animals are essential for the survival of other animals. 1

Q. 3. With the help of an example of a food chain, prove that the flow of energy in the biosphere is unidirectional. **A** [OD Comptt. 31/2 2017]

Ans. Sun $\xrightarrow{1\% \text{ Energy}}$ Producer/Plant $\xrightarrow{10\% \text{ Energy}}$

Primary consumer/Herbivore $\xrightarrow{10\% \text{ Energy}}$

Secondary consumer/Carnivore $\xrightarrow{10\% \text{ Energy}}$ Top Carnivore.

The above concept explained with the help of an example highlighting.

- (1) At each trophic level only 10% of the energy is passed on to the next and the rest is either utilized for its own metabolic activities or is lost in the environment as heat.
- (2) Lost energy is not returned to the previous level/ Solar input.

COMMONLY MADE ERROR

- Students often explain the flow of energy in biosphere, but they forget to give the example and lose marks.

ANSWERING TIP

- Comprehend what is being asked before answering by reading the question carefully.

AI Q. 4. Why are bacteria and fungi called decomposers? List any two advantages of decomposers to the environment? [Delhi Comptt. 31/1/3 2017]

Ans. Bacteria and fungi break down/decompose the dead remains and waste products or organisms. 1

Advantages:

- (i) Natural replenishment of soil
- (ii) Recycling of nutrients in the soil. 1

[CBSE Marking Scheme, 2017]

Detailed Answer:

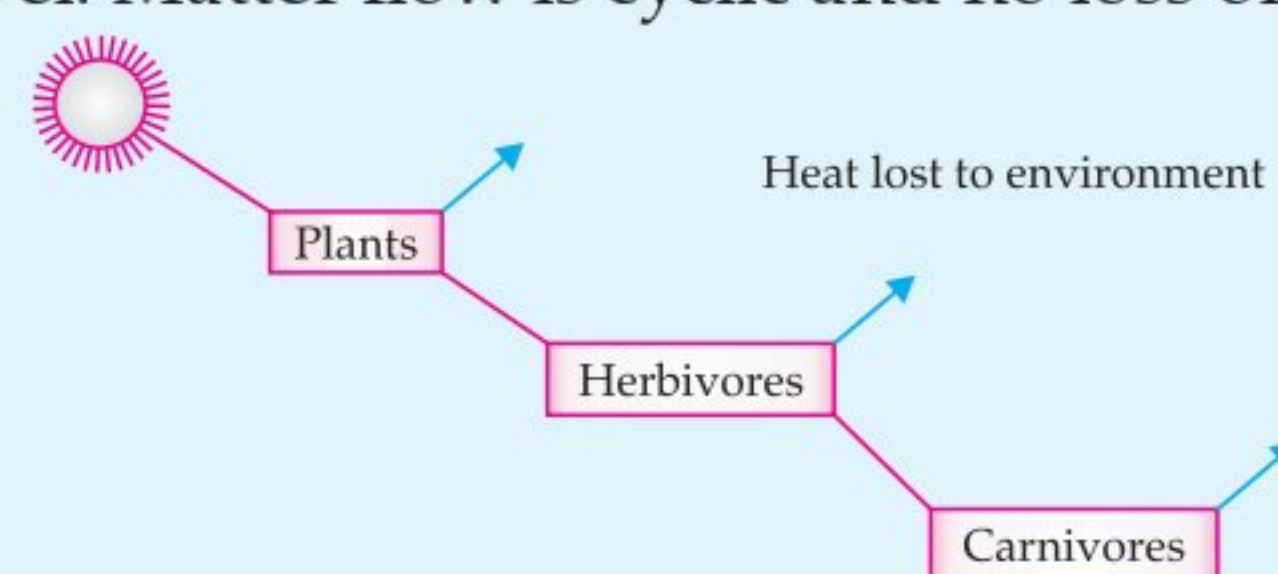
Bacteria and fungi are called decomposers because they decompose or consume the dead remains of other organisms.

Advantages.

- (i) Decomposers degrade garbage and the organic wastes which would otherwise cause environment problems.
- (ii) Decomposers recycle the nutrients through biochemical cycle. 1+1

Q. 5. Draw a labelled diagram to illustrate energy flow in an ecosystem. [Board Term II, 2015]

Ans. Energy flow is unidirectional, dissipated at each level. Matter flow is cyclic and no loss of matter. 1



[CBSE Marking Scheme, 2015]

COMMONLY MADE ERROR

- Students often draw incorrect energy flow chart. Many of them forget to label the part.

ANSWERING TIP

- Practice self-explanatory diagrams/flow chart with proper labelling, arrows and headings.

Q. 6. Differentiate between the food habits of organisms belonging to first and second trophic levels.

[Board Term II, 2015]

Ans. Difference between food habits of organisms belonging to first trophic level and second trophic level:

- (a) The organisms at the first trophic levels are primary producers which make organic compounds using inorganic inputs like light, water, carbon dioxide etc. E.g. Plants.
- (b) The organisms at the second trophic level are primary consumer. They are herbivores who eat plants (producers) for nutrition. E.g., Deer. 1+1

[CBSE Marking Scheme, 2015]



Short Answer Type Questions-II

3 marks each

Q. 1. (a) Define ecosystem.

(b) Autotrophs are at the first level of food chain. Give reason.

(c) In a food chain of frogs, grass, insects and snakes, assign trophic level to frogs. To which category of consumers do they belongs to?

[Outside Delhi, Set- II, 2020]

Ans. (a) Ecosystem: It is the functional unit of the environment comprising living and non living components.

(b) The first trophic level in a food chain is always producers (plants) because they have the ability to trap solar energy with the help of chlorophyll. As a result, they produce food by photosynthesis.

(c) Frogs are secondary consumers. 1×3=3

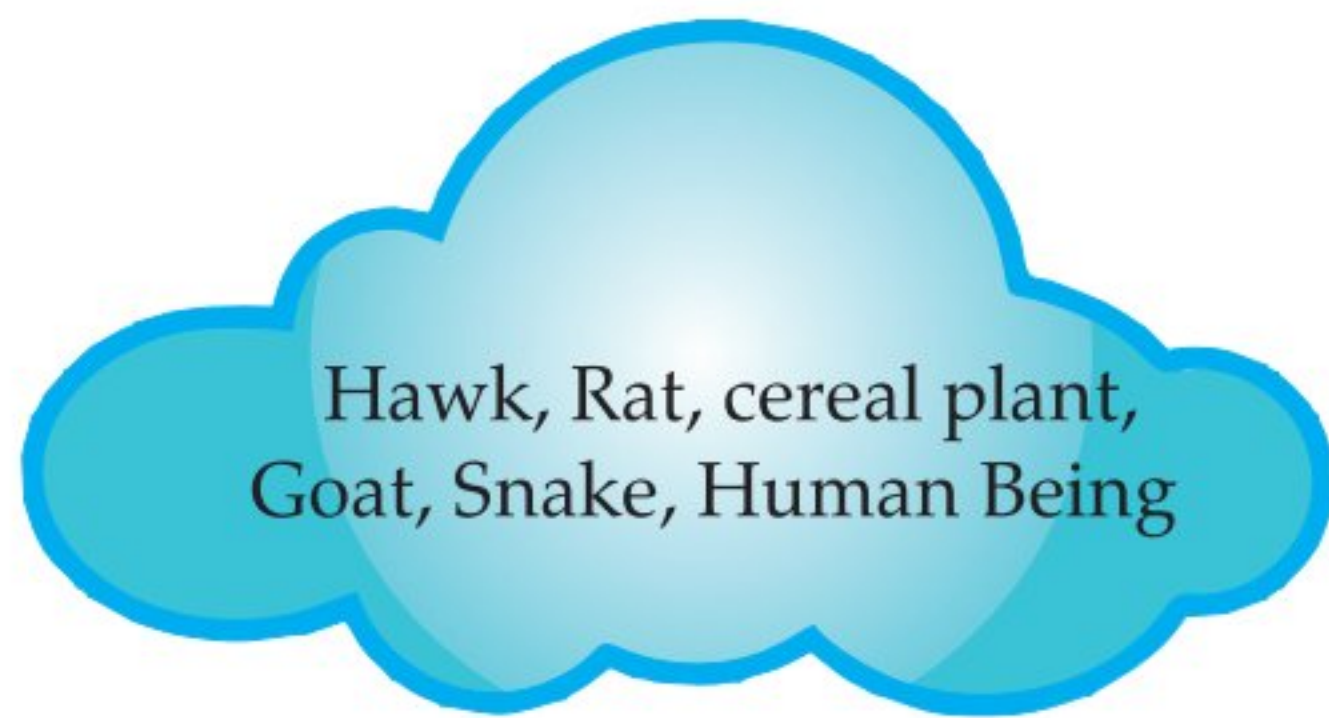
COMMONLY MADE ERROR

- Students often write incorrect definitions.

ANSWERING TIP

- The definition should be crisp and precise. Keywords should be highlighted in definitions.

Q. 2. (a) From the following groups of organisms create a food chain which is the most advantageous for Human being in terms of energy.



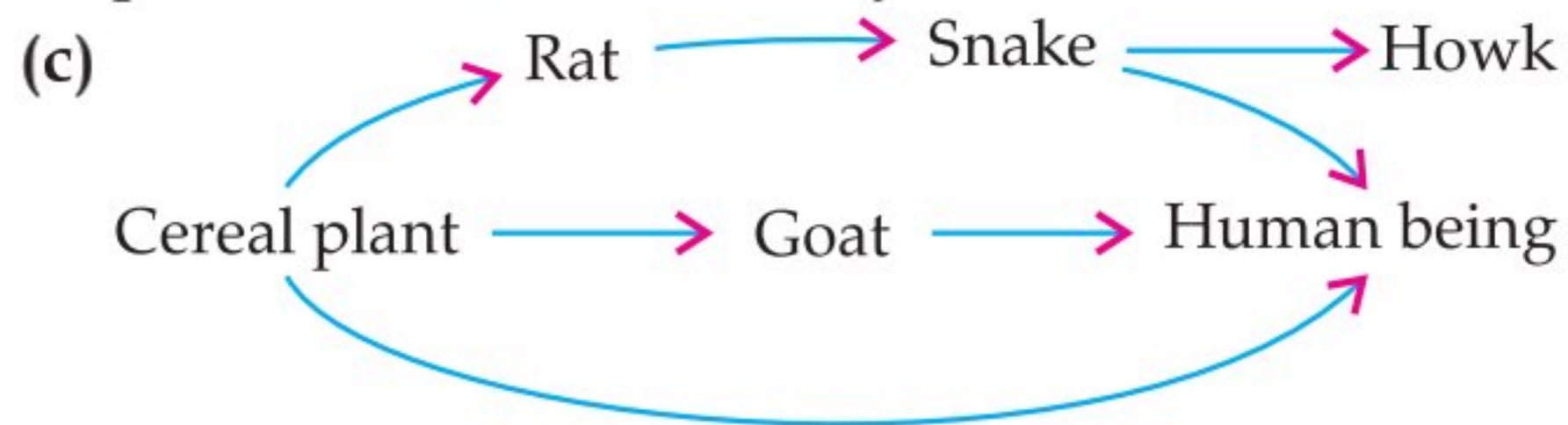
(b) State the possible disadvantage if the cereal plant is growing in soil rich in pesticides.

(c) Construct a food web using the organisms mentioned above. [A] [Outside Delhi, Set-I, 2020]

Ans. (a) Short food chains are more efficient in terms of energy. The shorter the food chain is, more is the available amount of energy.

Cereal Plant → Human being

(b) Harmful for human consumption as the traces of pesticide will be carried by food.



1×3=3

Q. 3. (a) State with reason the consequence of decrease in number of carnivores in an ecosystem.

(b) In a food chain, state the trophic level at which the concentration of harmful chemicals is maximum. Why is it so? [Outside Delhi, Set-II, 2020]

Ans. (a) The carnivores keep the populations of other carnivores and herbivores help to keep check. If there were no carnivores, the herbivore populations would rise exponentially and they will rapidly consume large amounts of plants and fungi, growing until there is not enough food to sustain them. Eventually, the herbivores would starve, leaving only those plants that were distasteful or poisonous to them. Species diversity would, therefore, drop dramatically.

(b) The increase in concentration of harmful chemical substances like pesticides in the body of living organisms at each trophic level of a food chain is called biological magnification. The level of biomagnification would increase as the trophic level increases and would be highest for topmost trophic level. It is because certain harmful substances, usually ones not found in nature but introduced by man, may get accumulated into plants and/or animals. These poisonous substances may not be broken down in the body or excreted easily. Instead, they accumulate in the tissues, and as the living organism eats more, the concentration of these substances increases and pass from one trophic level to the next. The maximum concentration is accumulated at the top carnivore's level.

1½ + 1½=3

Q. 4. (i) Create a terrestrial food chain depicting four trophic levels.

(ii) Why do we not find food chains of more than four trophic levels in nature? [A] [Board SQP, 2020]

Ans. A food chain showing Ist trophic level (½ mark), IInd trophic level (½ mark), IIIrd trophic level (½ mark) and IVth trophic level (½ mark).

A flow chart or a diagrammatic representation showing all the four trophic levels would also be accepted

According to the 10% law, the amount of energy available will not be sufficient for the survival of the organism in the 5th trophic level.

[CBSE Marking Scheme, 2020]

Detailed Answer:

(i) Rice (Producers) → Rat (Herbivores) → Snake (Carnivores) → Peacock (Top carnivores)

(ii) This is because according to 10 percent law of energy transfer, only 10 percent of the energy passes from one trophic level to the next. Thus, the amount of energy goes on decreasing with the successive trophic levels.

Q. 5. How will you create an artificial aquatic ecosystem, which is self-sustainable? [A] [CBSE SQP, 2020]

Ans. (a) Large jar filled with water, oxygen, food and aquatic plants and animals.

(b) Oxygen/oxygen pump.

(c) Fish food.

(d) Aquatic plants/Producers provide O₂ during photosynthesis.

(e) Aquatic animals/Consumers release CO₂ for the process of photosynthesis.

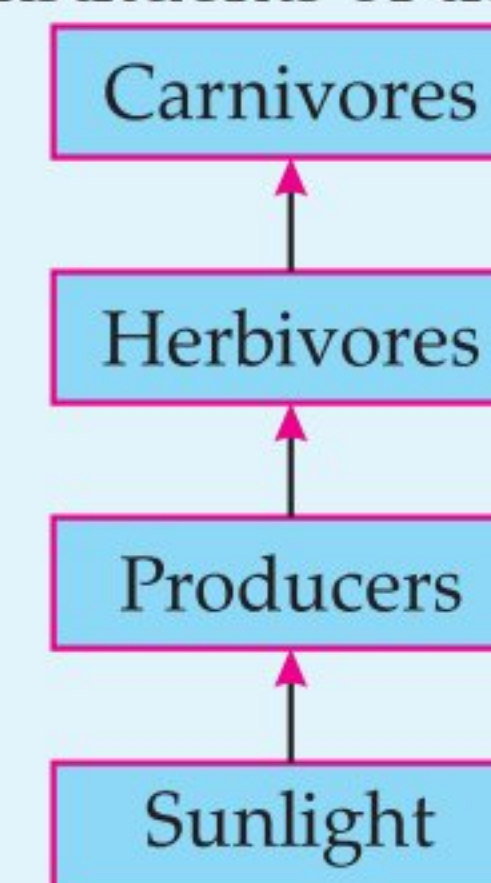
(f) Decomposers are also important for natural cleaning of the aquarium. ½ × 6

[CBSE Marking Scheme, 2020]

Q. 6. Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem.

[R] [Board Delhi, Set-I, 2019]

Ans. Ecosystem: The system where all the living organisms in an area together interact with the non-living constituents of the environment.



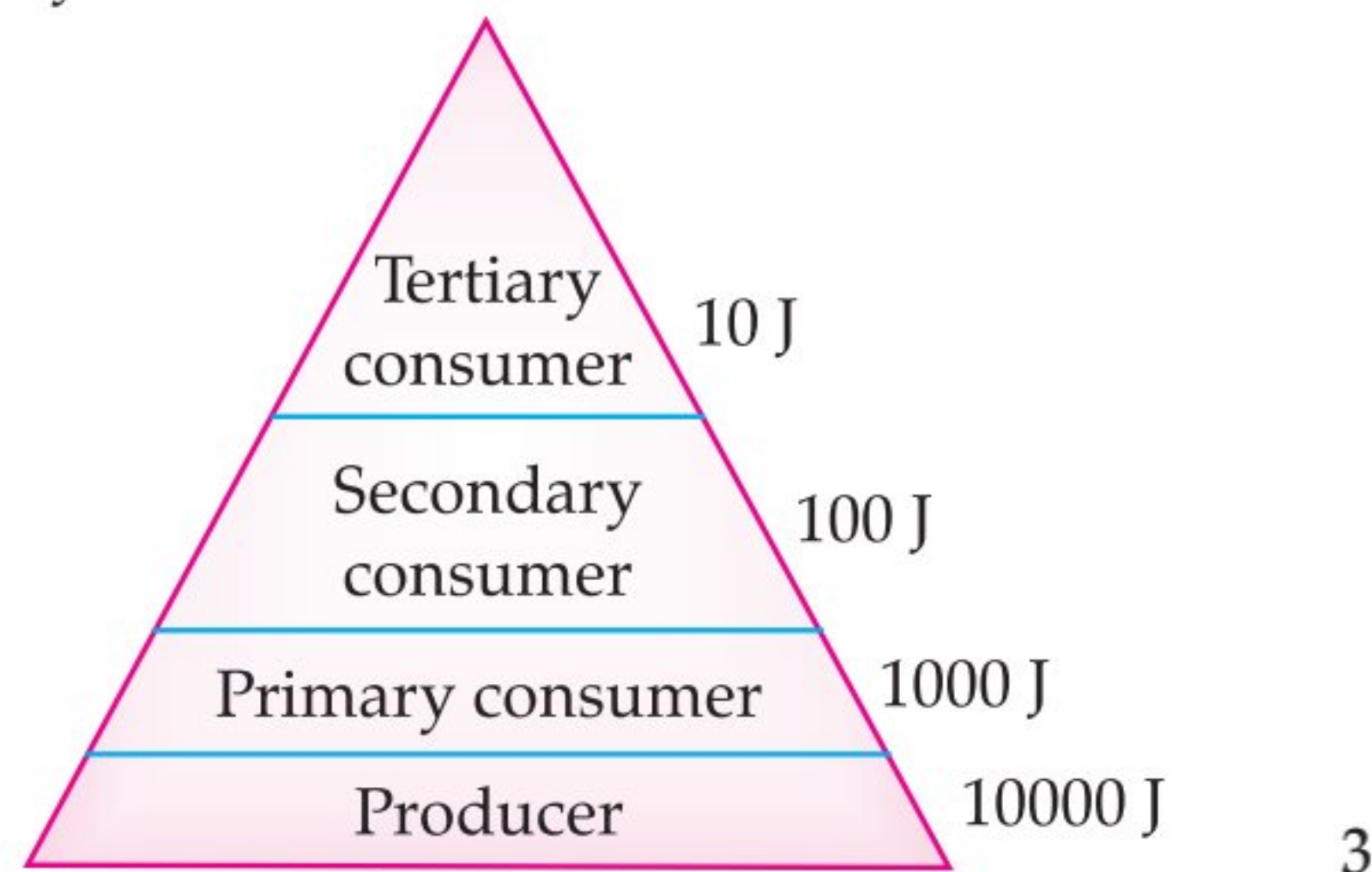
1 + 2 [CBSE Marking Scheme, 2019]

Detailed Answer:

An ecosystem can be defined as a functional unit of nature, where living organisms interact among themselves and with the surrounding physical environment.

Diagram to show the flow of energy in an ecosystem: Assuming 10,000 J of energy is available

to the producers, then 1000 J will be available to the primary consumers, 100 J will be available to secondary consumers and 10 J will be available to tertiary consumers.



Q.7. Define a food chain. Design a terrestrial food chain of four trophic levels. If a pollutant enters at the producer level, the organisms of which trophic level will have the maximum concentration of the pollutant in their bodies? What is this phenomenon called?

[Board Outside Delhi, Set- III, 2019]

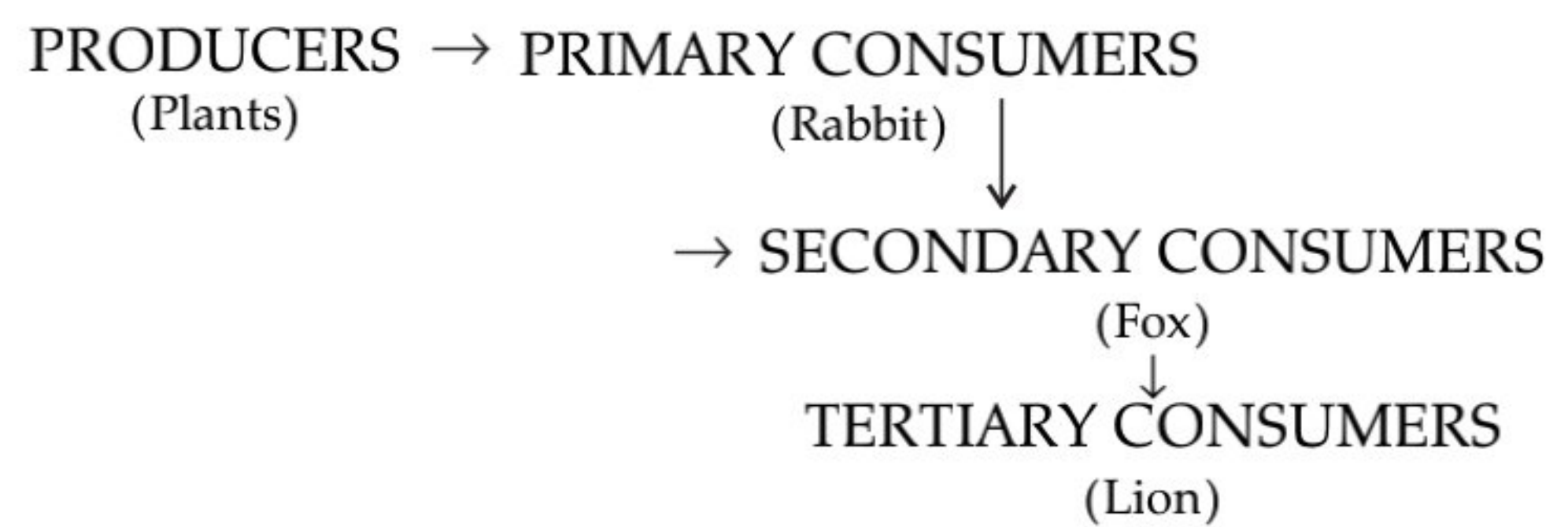
Ans. Chain of organisms formed as a result of eating or being eaten by organisms is called *food chain* / A series of organisms feeding on one another, is called *food chain*.

Grass → Insect → Frog → Snake
 (Producer) (Herbivore) (Carnivore) (Top Carnivore) 1
 (Any other example of food chain)
 • Tertiary trophic level / snake ½
 • Biological magnification / Biomagnification
 [CBSE Marking Scheme, 2019] ½

Detailed Answer:

Food chain is the series formed of organisms feeding on one another at various biotic levels.

Terrestrial Food Chain:



The organisms at the highest (top) trophic level have the maximum concentration of the pollutant in their bodies. This phenomenon is known as biological magnification. 1+1+1

Q. 8. What is a food chain? Why is the flow of energy in an ecosystem unidirectional? Explain briefly.

[CBSE Delhi, 2019]

Topper Answer, 2019

Ans. 14. (1) Food Chain is a sequence of organisms in which one consumes the other to transfer energy.

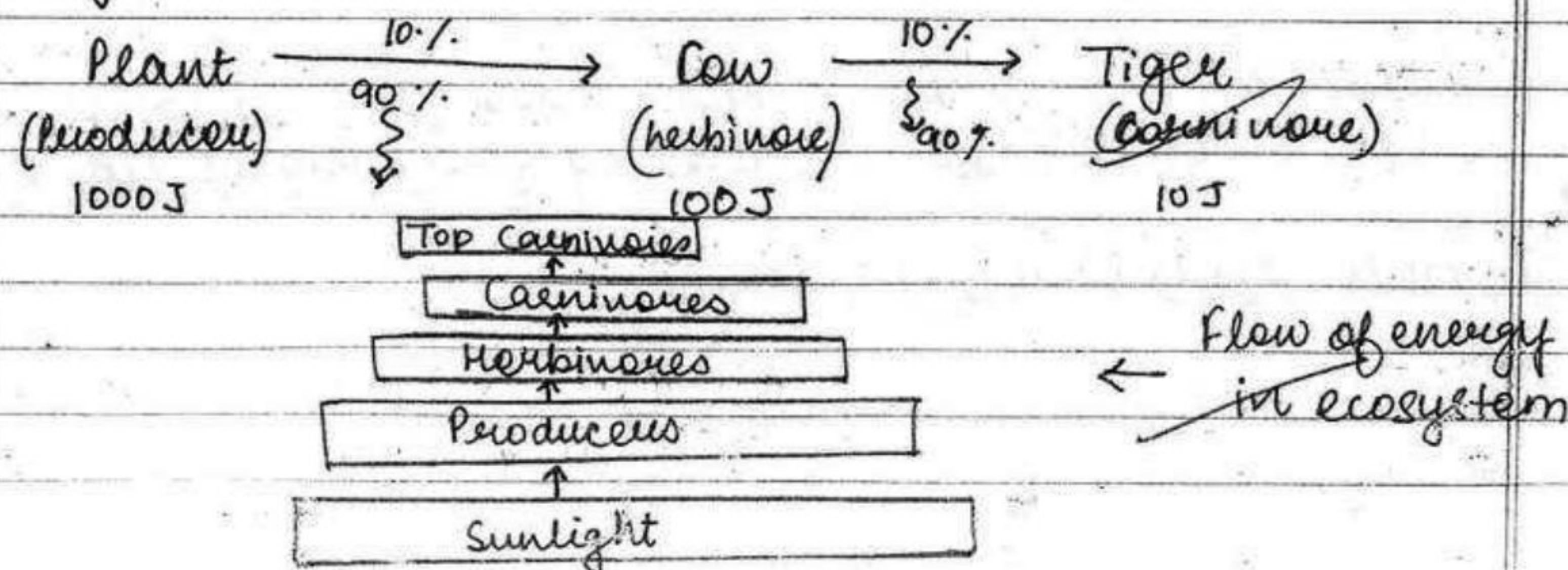
for eg.

~~Plant~~ Grass. $\xrightarrow{10\%}$ House $\xrightarrow{10\%}$ Lion
 (Producer) (Herbivore) (Carnivore).
 { 90% } { 90% }

(2) The flow of energy in an ecosystem is always unidirectional as they cannot revert back the energy consumed or lost in environment.

- ③ For example, plants cannot revert back the chemical energy into solar energy.
- ④ Since they move progressively from one trophic level to the other, the energy content goes on decreasing according to 10% law.
- ⑤ They do not have that much energy to reverse the flow even if they want to.

For eg.



Q. 9. The flow of energy between various components of the environment has been extensively studied. Give an outline of the findings.

U [CBSE SQP 2018-19]

- Ans. (i) Flow of energy is unidirectional.
 (ii) Terrestrial plants take about 1% of the Sun's energy and change it to chemical energy.
 (iii) A great amount of energy is lost as heat/ used for digestion/doing work/growth and reproduction.
 (iv) Only 10% of organic matter present at each trophic level (and available to the next trophic level).
 (v) Food chains are mainly of 3-4 trophic levels (because of 10 percent law).
 (vi) The number of producers are maximum (the number reduces in subsequent trophic levels).
 (vii) Food webs are more common (as compared to isolated food chains).
 (viii) Biological magnification can be observed.

(Any three) 3

[CBSE Marking Scheme, 2018-19]

Q. 10. Your mother always thought that fruit juices are very healthy for everyone. One day she reads in the newspaper that some brands of fruit juices in the market have been found to contain certain level of pesticides in them. She got worried as pesticides are injurious to our health.

- (a) How would you explain to your mother about fruit juices getting contaminated with pesticides?

- (b) It is said that when these harmful pesticides enter our body as well as in the bodies of other organisms they get accumulated and beyond a limit may cause harm and damage our organs. Name the phenomenon and write about it.

C [CBSE Board, Foreign Scheme, 2017]

- Ans. (a) (i) Farmers generally use pesticides on fruit crops to protect their crops from plant diseases. However, pesticides may contaminate the fruit and therefore fruit juices also become contaminated. ½
 (ii) Using contaminated ground water for irrigation also makes the fruits infected with contaminants. ½
 (b) Biological magnification or bio-magnification is the accumulation of chemicals in the individuals of higher trophic level. Chemicals are non-biodegradable and their concentration increases at each trophic level. Humans, being at the top of food chain, also receive higher concentration of these harmful chemicals resulting into various health problems. 2

Q. 11. Give reason to justify the following:

The existence of decomposers is essential in a biosphere. A [Board Term II, Delhi Set I, 2016]

- Ans. The existence of decomposers is essential in a biosphere because they breakdown complex organic substances into simple inorganic substances that can be absorbed by the plants.

Thus, decomposer:

- (a) replenish the soil naturally,
- (b) helps in removing the biodegradable waste. 3

[CBSE Marking Scheme, 2016]

AI Q. 12. What is an ecosystem? List its two main components. We do not clean natural ponds or lakes, but an aquarium needs to be cleaned regularly. Why is it so? Explain.

U [Board Term II, O.D. Set II, 2015]

Ans. Ecosystem is the structural and functional unit of biosphere, comprising of all the interacting organisms in an area together with the non-living constituents of the environment.

Two main components of Ecosystem are:

- (i) Biotic component
- (ii) Abiotic component

An aquarium is an artificial and incomplete ecosystem compared to pond or lakes which are natural, self-sustaining and complete ecosystem where there is a perfect recycling of materials.

We need to clean the aquarium because of the:

(i) absence of natural decomposer.

(ii) stagnancy of water.

1 + 1 + 1

AI Q. 13. 'Energy flow in food chains is always unidirectional'. Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body.

C [Board Term II, Delhi Set I, 2015]

[Board Term II, Outside Delhi Set I, III, 2014]

Ans. (i) In a food chain the energy moves progressively through the various trophic levels and is no longer available to the organisms of the previous trophic level/ energy captured by the autotrophs does not revert back to the solar input. 1

(ii) Pesticides used for crop protection when washed away/down into the soil/water bodies absorbed by plants/ producers. 1

(iii) On consumption they enter our food chain and being non-biodegradable, these chemicals get accumulated progressively and enter our body. 1

[CBSE Marking Scheme, 2015]



Long Answer Type Questions

5 marks each

Q. 1. Suggest any four activities in daily life which are eco-friendly. **A** [NCERT Exemp.]

Ans. Activities in daily life which are eco-friendly are given below :

- (i) Use of compost and vermicompost in place of fertilisers. 1
- (ii) Separation of biodegradable and non-biodegradable substances. 1
- (iii) Gardening 1
- (iv) Use of gunny bags or paper bags in place of polythene. 1
- (v) Rain water harvesting 1

COMMONLY MADE ERROR

- Students often repeat the points and write irrelevant stories.

ANSWERING TIP

- Always write the answer point wise and each point must reflect a separate idea. Do not repeat the same point in different words.

Q. 2. Explain some harmful effects of agricultural practices on the environment.

AE [NCERT Exemp.]

Ans. Some harmful effects of agricultural practices on the environment are :

(i) Excess use of ground water for agriculture lowers the water level. 1

(ii) Excessive use of fertilisers affects the soil pH and kills useful microbes. 1

(iii) Excessive use of chemical pesticides lead to bio-magnification. 1

(iv) Extensive agriculture causes loss of soil fertility. 1

(v) Burning of agricultural waste like paddy and wheat straw results into the formation of smog that pollutes environment substantially. ½

(v) It affects our natural eco-system. ½

AI Q. 3. (a) Indicate the flow of energy in an ecosystem. Why is it unidirectional? Justify.

(b) What will happen if decomposers are absent in an ecosystem?

Ans. (a) The flow of energy is generally from

Sun → producer → herbivore → carnivore.

Since the flow of energy is progressively from one trophic level to another and does not revert back, it is said to be unidirectional. Further, the available energy decreases in the higher trophic levels making it impossible for energy to flow in the reverse direction.

(b) Decomposers include micro-organisms such as bacteria and fungi that obtain nutrients by breaking down the remains of dead plants and animals.

It breaks down the complex organic substances of garbage, dead animals and plants into simpler inorganic substances that go into the soil and are used up again by the plants.

In the absence of decomposers, recycling of material in the biosphere will not take place. 2 ½ + 2 ½



TOPIC - 2

Biodegradable and Non-Biodegradable Substances and Global Warming



Revision Notes

- **Waste Materials:** Improvements in lifestyle have resulted in accumulation of large amounts of waste materials.
- **Garbage contains following type of materials:**
 - (a) **Biodegradable Wastes:** Substances which can be decomposed by the action of micro-organisms are called as *biodegradable wastes*. *e.g.*, fruit and vegetable peels, cotton, jute, dung, paper, etc.
 - (b) **Non-biodegradable Wastes:** Substances which cannot be decomposed by the action of micro-organisms are called as non-biodegradable wastes. *e.g.*, plastic, polythene, metals, synthetic fibres, radioactive wastes, pesticides, etc.
- **Methods of Waste Disposal:**
 - (a) **Biogas Plant:** Biodegradable waste can be used in biogas plant to produce biogas and manure.
 - (b) **Sewage Treatment Plant:** The drain water can be cleaned in sewage treatment plant before adding it to rivers.
 - (c) **Land Fillings:** The wastes are buried in low lying areas and are compacted by rolling with garbage changes to manure.
 - (e) **Recycling:** Non-biodegradable waste are recycled to make new items.
 - (f) **Reuse:** It is a conventional technique to use an item again *e.g.*, newspaper for making envelopes.
- Ozone (O_3) is not the isotope of oxygen. It is a molecule formed by three atoms of oxygen. Ozone performs an essential function of shielding the surface of the earth from ultraviolet radiation of the sun.
$$O_2 + O \longrightarrow O_3$$
- Ozone layer is a layer of the earth's atmosphere in which most of the atmosphere's ozone is concentrated.
- Ozone layer protects the earth from harmful UV radiations.
- There are several reasons for depletion of the ozone layer.
- The foremost is the use of chlorofluorocarbons (CFCs). The other factor responsible for ozone destruction is the pollutant nitrogen monoxide (NO).
- When the harmful chemicals like chlorofluorocarbons (CFCs) are released into the air, it accumulates in the upper atmosphere and reacts with ozone resulting in reduction in thickness of the ozone layer.
- Thus, the ozone layer in the atmosphere becomes thinner and gets depleted allowing more ultraviolet rays to pass through it. This phenomenon is referred as *the Ozone hole*.
- The Antarctic hole in ozone layer is caused due to chlorine molecules present in chlorofluorocarbons (CFCs), that are used by human beings.

How is it done on the GREENBOARD?

Q. Plastic cups were used to serve tea in trains in early days- these could be returned to the vendors, cleaned and reused. Later, Kulhads were used instead of plastic cups. Now, paper cups are used for serving tea. What are the reasons for the shift from Plastic to Kulhads and then finally to paper cups ?

Ans. Step I: Plastic cups are non-biodegradable and harm the environ-

ment. They were, thus, replaced by Kulhads.

Step II: Making Kulhad, which is made of clay on a large scale resulted in the loss of top fertile soil.

Step III: Now, disposable paper cups are used because the paper can be recycled, it is biodegradable and is eco-friendly material, which does not cause environmental pollution.

Objective Type Questions

1 mark each

A Multiple Choice Questions

Q. 1. Which one of the following green house gases is a contributor due to incomplete combustion of coal and petroleum?

- (a) Oxides of nitrogen
- (b) Methane
- (c) Carbon monoxide
- (d) Carbon dioxide

[Board SQP, 2020]

Ans. Correct option : (c)

Explanation : Incomplete combustion of coal and petroleum releases carbon monoxide, which is a contributor of greenhouse effect.

Q. 2. Depletion of ozone is mainly due to _____.

- (a) chlorofluorocarbon compounds.
- (b) carbon monoxide.
- (c) methane.
- (d) pesticides.

[NCERT Exemp.]

Ans. Correct option : (a)

Explanation : Depletion of ozone layer occurs due to chlorofluorocarbons (CFCs). Other chemicals do not cause depletion of ozone layer in the environment.

Q. 3. Excessive exposure of humans to UV-rays results in

- (i) damage to immune system.
 - (ii) damage to lungs.
 - (iii) skin cancer.
 - (iv) peptic ulcers.
- (a) (i) and (ii) (b) (ii) and (iv)
(c) (i) and (iii) (d) (iii) and (iv)

[NCERT Exemp.]

Ans. Correct option : (c)

Explanation : Excessive exposure of humans to ultraviolet (UV)-rays results in :

- (i) Skin cancer.
- (ii) Damage to the immune system of the body.

Q. 4. Which of the followings are environment-friendly practices?

- (a) Carrying cloth-bags to put purchases in while shopping.
- (b) Switching off unnecessary lights and fans.
- (c) Walking to school instead of getting your mother to drop you on her scooter.
- (d) All of the above.

[NCERT Ex.]

Ans. Correct option : (d)

Explanation : The eco-friendly habits that we should adopt in our day-to-day life are:

- (i) Switch off the lights when not in use.
- (ii) Walk to school or use bicycle.
- (iii) Always carry cotton bags instead of using plastic bags.

B Assertions and Reasons Type Questions

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
- (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true but reason (R) is false.
- (d) Assertion (A) is false but reason (R) is true.

Q. 1. Assertion (A): CFCs deplete the ozone layer.

Reason (R): CFCs are used as refrigerants and in fire extinguishers.

Ans. Correct option : (a)

Explanation: Ozone layer is getting depleted at the higher levels of the atmosphere due to effect of chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers.

Q. 2. Assertion (A): Polythene bags and plastic containers are non-biodegradable substances.

Reason (R): They can be broken down by micro-organisms in natural simple harmless substances.

Ans. Correct option : (c)

Explanation: Substances like polythene bags and plastics are non-biodegradable because they cannot be broken down by micro-organisms into simpler harmless substance in nature. Substances that can be broken down by micro-organisms in natural simple harmless substances are biodegradable substances.

Q. 3. Assertion (A): Ozone is both beneficial and damaging.

Reason (R): Stop the release of chlorofluorocarbons to protect the ozone.

Ans. Correct option : (b)

Explanation: Ozone is damaging as it is a deadly poison. It is beneficial as it shields the surface of the earth from UV radiations of the Sun. We should stop the release of Chlorofluorocarbons (CFCs) to protect the ozone.

C Very Short Answer Type Questions

Q. 1. Explain how ozone being a deadly poison can still perform an essential function for our environment. [A] [Board SQP, 2021]

Ans. Ozone layer protects us from harmful effects of UV radiation. 1

Q. 2. State the essential function performed by Ozone at the higher levels of the atmosphere.

[R] [Delhi Comptt. 31/1/1 2017]

Ans. It shields the surface of the earth from ultraviolet (UV) radiation from the sun. 1

Q. 3. What is biodegradable substance? [R] [Delhi Comptt. 2017]

Ans. Substances that can be broken down by micro-organisms in natural simple harmless substances. 1

Q. 4. Why should biodegradable and non-biodegradable wastes be discarded in two different dustbins? [R] [OD Comptt. 31/1 2017]

Ans. (i) Saves time/ energy in segregation.
(ii) Biodegradable items can be sent directly for composting.

(iii) Non-biodegradable items can be sent for a appropriate reuse/recycle. $\frac{1}{2} \times 2$ [Any two] [CBSE Marking Scheme, 2017]

Detailed Answer:

Separation should be done actually to save our resources for future benefits and to save our environment from pollution.

Q. 5. The depletion of ozone layer is a cause of concern. Why? [A] [Board Term II, O.D. Set I, 2016]

Ans. Ultraviolet rays from the sun penetrate down the atmosphere and cause health hazards/skin cancer in human beings. [CBSE Marking Scheme, 2016] 1

Detailed Answer:

Ozone layer shields the earth surface from ultraviolet (UV) radiation of the Sun. These UV-rays may reach the earth due to depletion of ozone layer and cause health hazards/skin cancer in human beings. Therefore, it is a cause of concern.

Q. 6. Why is excessive use of CFCs a cause of concern? [AE] [Board Term II, Foreign Set III, 2016]

Ans. When CFC's reach upper layers of the atmosphere, they cause depletion of ozone layer, and allow harmful UV radiations to reach the surface of the earth to create health hazards. $\frac{1}{2} + \frac{1}{2}$ [CBSE Marking Scheme, 2016]

[AI] Q. 7. Write one negative effect, on the environment, of affluent life style of few persons of a society.

[AE] [Board Term II, O.D. Set II, 2016]

Ans. Use of excessive non-biodegradable material in packaging:

Excessive use of natural resources like coal and petroleum which causes pollution.

Affluent lifestyle results in generation of excessive waste materials. (Any one) 1

[CBSE Marking Scheme, 2016]

[AI] Q. 8. Write the full name of the group of compounds mainly responsible for the depletion of ozone layer. [R] [Board Term II, Foreign Set I, 2015]

Ans. Chlorofluorocarbons. 1

[CBSE Marking Scheme, 2015]

COMMONLY MADE ERROR

→ Students often write incorrect spelling of the chemical compound i.e. chlorofluorocarbon.

ANSWERING TIP

→ Learn the spelling of chlorofluorocarbon carefully as incorrect spelling may deduct your marks.

[AI] Q. 9. What is the function of ozone in the upper atmosphere? [R] [Board Term II, Delhi Set I, 2015]

Ans. Ozone layer protects the earth from harmful radiations like high energy ultraviolet radiations.

[CBSE Marking Scheme, 2015] 1

✓ Short Answer Type Questions-I

2 marks each

Q. 1. How is ozone both beneficial and damaging? How can we prevent the damaging effect of ozone?

[U] [CBSE SQP 2019]

Ans. Damaging as it is a deadly poison. Beneficial as it shields the surface of the earth from UV radiations of the Sun.

By not using synthetic chemicals like CFCs, that deplete Ozone layer. 1 + 1

[CBSE Marking Scheme, 2019]

Q. 2. What is Ozone? Name the chemicals that damage the Ozone layer. [R] [Delhi Comptt. 2017]

Ans. Ozone is a gas made up of three oxygen atoms, occurs naturally in small amounts in the upper atmosphere and protects life on Earth from the Sun's ultraviolet (UV) radiations. The chemical that damage Ozone layer is Chlorofluorocarbon (CFCs). 1+1

COMMONLY MADE ERROR

→ Students often write incorrect spelling of Chloro-fluorocarbon.

ANSWERING TIP

→ Practice writing the correct spelling of CFCs and all biological terms.

[AI] Q. 3. How can you help in reducing the problem of waste disposal? Write any two methods.

[U] [OD Comptt. 31/3 2017]

Ans. Segregation of waste at the point of its generation for convenient disposal.

Change in attitude producing less waste by adopting 3 R's policy.

1+1 [CBSE Marking Scheme, 2017]

Detailed Answer:

We can help in reducing the problem of waste disposal by these methods:

(i) By separating biodegradable substances from non-biodegradable substances.

(ii) By reducing, reusing and recycling non-biodegradable substances. 1+1

Q. 4. Give any two ways in which biodegradable substances would affect the environment.

Ans. (i) They produce foul smell during decomposition process. 1

(ii) They may produce harmful gases such as ammonia, methane and carbon dioxide. 1

COMMONLY MADE ERROR

Students often write the effects of non-biodegradable substances on environment, instead of biodegradable.

ANSWERING TIP

Read the questions properly before answering. Learn the concept of biodegradable and non-biodegradable substances carefully along with their effects on environment.

AI Q. 5. Write the harmful effects of using plastic bags, on the environment. Suggest alternatives to plastic bags. [A]

Ans. Plastic bags are non-biodegradable wastes, they are not degraded, they begin to stink, emitting foul gases, spoil the beauty of places and contaminate soil, water and air with toxins.

Cloth bags are used instead of plastic bags because they are stronger, more durable and washable. 1+1



Short Answer Type Questions-II

3 marks each

Q. 1. Plastic cups were used to serve tea in trains in early days- these could be returned to the vendors, cleaned and reused. Later, Kulhads were used instead of plastic cups. Now, paper cups are used for serving tea.

What are the reasons for the shift from Plastic to Kulhads and then finally to paper cups?

[A] [CBSE SQP, 2021]

Ans. Plastic cups are non-biodegradable and harm the environment. They were, thus, replaced by Kulhads.

Making Kulhad, which is made of clay on a large scale resulted in the loss of top fertile soil.

Now, disposable paper cups are used because the paper can be recycled, it is biodegradable and is eco-friendly material, which does not cause environmental pollution. 1

[CBSE Marking Scheme, 2021]

Q. 2. (a) Write two harmful effects of using plastic bags on the environment. Suggest alternatives to the usage of plastic bags.

(b) List any two practices that can be followed to dispose off the waste produced in our homes.

[A] [Outside Delhi, Set- I, 2020]

Ans. (a) Harmful effects of plastic bags:

(i) Plastics do not undergo degradation, thus stay in soil for many years. This may affect the soil fertility and degrades the soil quality.

(ii) When plastic artifacts enter the drainage and sewerage system, they block the pipes and drains causing water logging.

(iii) Littering of plastics in open spaces creates unhygienic conditions, as it act as breeding ground for insects and mosquitoes. (Any two)

We can reduce the use of plastic bags and carry jute bags and paper bags to carry items from the market.

(b) Measures taken for proper disposal of waste produced at our homes are:

(i) Prepare a compost pit for kitchen wastes.

(ii) Safe disposal of plastic bags.

(iii) Segregation of biodegradable and non biodegradable wastes.

(iv) Fruit peels can be placed near trees or plants, which on decomposition will enrich the soil with nutrients.

(v) Recycling of paper wastes. (Any two) 2+1=3

COMMONLY MADE ERROR

- Students often repeat the same point again and again. Many of them write answers in paragraph form rather than point wise.

ANSWERING TIP

- Always write the answer point wise and each point must reflect a separate idea. Do not repeat the same point in different words.

Q. 3. (a) Explain the role of UV radiation in producing ozone layer.

(b) Mention the reaction involved.

(c) Why is excessive use of CFCs a cause of concern?

[Outside Delhi, Set- II, 2020]

Ans. (a) Ozone is formed in the upper atmosphere when solar UV radiation dissociated molecules of oxygen (O) and then this oxygen atom (O) combines with an oxygen molecule.

(b) Reaction involved: $O_2 \xrightarrow{\text{UV}} O + O$
 $O + O_2 \xrightarrow{\text{UV}} O_3$

(c) When CFC's reach upper layers of the atmosphere, they cause depletion of ozone layer, and allow harmful UV radiations to reach the surface of the earth to create health hazards. $1 \times 3 = 3$

COMMONLY MADE ERROR

- Students often write incorrect reactions. They often do mistake while writing the symbols of Oxygen (O₂) and Ozone (O₃).

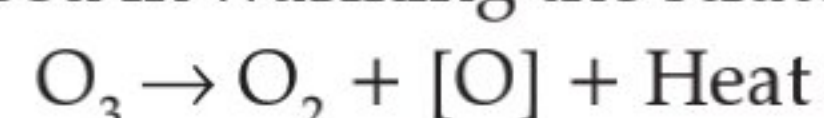
ANSWERING TIP

- Carefully learn the reactions involved in formation of ozone layer. Students are advised to read the questions carefully and answer the questions part-by-part.

Q. 4. How is ozone layer formed? State its importance to all life forms on earth? Why the amount of ozone in the atmosphere dropped sharply in the 1980s?

[Outside Delhi, Set- III, 2020]

Ans. Formation of ozone in Atmosphere: Ozone is continuously formed by the action of UV rays on molecular oxygen, and also degraded into molecular oxygen in the stratosphere. The high energy ultraviolet radiations split ozone into molecular and atomic oxygen with large amount of heat. This heat is used in warming the stratosphere.



This oxygen atom then recombine with oxygen (O₂) molecule to form ozone molecule.

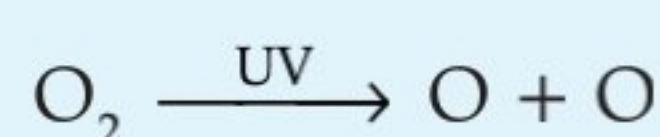


The ozone layer acts as a protective blanket around the earth which shields the entire earth from harmful ultraviolet radiations that come from the sun. Ozone depletion is the reduction in concentration of ozone layer. It is formed due to an increased concentration of ozone-depleting substances such as chlorofluorocarbons (CFCs). CFCs are used in refrigerants, ACs, fire extinguishers, aerosols spray etc. $1 \times 3 = 3$

Q. 5. Write the essential function performed by ozone at the higher levels of the Earth's atmosphere? How is it produced? Name the synthetic chemicals mainly responsible for the drop of amount of ozone in the atmosphere. How can the use of these chemicals be reduced?

[Board Outside Delhi, Set-I, 2019]

Ans. It shields the surface of the earth from the UV radiation from the sun. 1



$O_2 + O \rightarrow O_3$ {or description of this process in words} 1

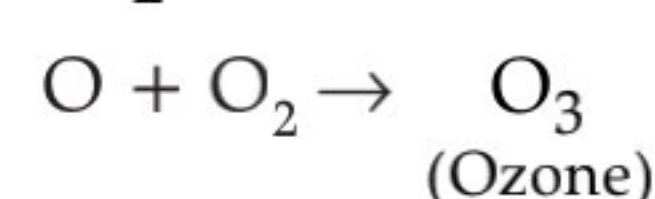
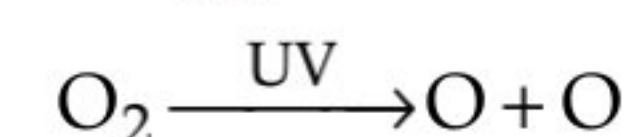
Chloro Fluoro Carbons (CFC's) $\frac{1}{2}$

Reduce the use of CFC's by (a) minimizing the leakage through air conditioners and refrigerators / finding substitute chemicals that are ozone friendly. [CBSE Marking Scheme, 2019] $\frac{1}{2}$

Detailed Answer:

Ozone protects the surface of earth from harmful ultraviolet (UV) radiations emitted by the sun.

Ozone is a product of UV radiation acting on oxygen (O₂) molecule. The higher energy UV radiations split apart some molecular oxygen (O₂) into free oxygen (O) atoms. These atoms combine with molecular oxygen to form ozone.



Chlorofluorocarbons (CFCs) are mainly responsible for the drop of amount of ozone in the atmosphere. Use of these chemicals can be reduced by using alternate products that do not harm the ozone layer. Also, safe disposal of old appliances like refrigerators prevents its emission.

COMMONLY MADE ERROR

- Students often given incorrect explanation. Many of them forget to answer the sub parts of the question.

ANSWERING TIP

- Learn the concept of ozone layer and ozone depletion carefully. Lay emphasis on the hazards of CFCs on environment.

Q. 6. Students in a school listened to the news read in the morning assembly that the mountain of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brain storming session, the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points – one is self management of the garbage we produce and the second is to generate less garbage at individual level.

- (a) Suggest two measures to manage the garbage we produce.
 (b) As an individual, what can we do to generate the least garbage? Give two points.

(c) List two values the teacher instilled in his students in this episode. [AE] [CBSE Delhi/OD Set-2018]

Ans.(a) Incineration/Waste compaction/Biogas generation/Composting/Segregation and safe disposal/Vermicomposting (Any other) (any two)

(b) Reuse of empty bottles, books etc.
 Reduce the use of non-biodegradable substances like polythene, thermocol, etc. (Any other)

(c) Awareness about environment, scientific attitude, concern for community health and personal health. (Any two) 1+1+1

[CBSE Marking Scheme, 2018]



Topper Answer, 2018

(a) (i) For managing garbage, first we must segregate it into biodegradable & non-biodegradable substances. Biodegradable substances like vegetable peels, domestic waste, animal excreta, cow dung etc. must be converted into manure. This not only helps in enriched growth of plants but also prevents dump of it in open, production of foul smell etc.

(ii) For non-biodegradable substances, we must further segregate as recyclable & non-recyclable. All recyclable metals, plastic, glass must be sent to different factories which after proper cleaning, process them into new products.

(iii) For rest over garbage, practices like filling it in landfills which can be converted into playground for children or incineration at places with proper management for it can be done.

(b) As an individual,

(i) We must follow the policy of 'reduce'. We should try to switch of lights when unnecessary for our resources & for garbage, try using some sheet of blank paper not used from other side, try making registers with utilising all the pages to reduce our demand for rough copies, reducing usage of plastic disposable cups.

(ii) We must follow the policy of 'reuse'. Using jam bottles, milk cartons, packaging boxes, ketchup bottles is a good way to use resources already once used.

(c) Teacher has instilled the values of 'environmental concern', 'eco friendliness', 'wise use of resources'.

Q. 7. You have been selected to talk on 'ozone layer and its protection' in the school assembly on 'Environment Day'.

- Why should ozone layer be protected to save the environment?
- List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

[C] [Delhi 31/1/2017]

Ans. (a) Because Ozone layer protects/shields the earth from harmful UV radiations of the sun. 1

(b) Conducting poster making competition highlighting effects of ozone layer depletion. 1

(c) Conducting street plays highlighting the ways of environment protection. 1

[CBSE Marking Scheme, 2017]

Detailed Answer:

(i) Ozone layer helps in shielding the Earth from the harmful UV radiations coming from sun. If ozone layer gets depleted, UV radiations can directly reach the earth's surface and drastically affect the life on earth.

(ii) Ozone layer can be protected by:

- Stopping the release of Chlorofluorocarbon
- Removing the pollutant nitrogen monoxide
- Reduce the usage of air conditioners.

[AI] Q. 8. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment.

[U] [Board Term II, O.D. Set I, 2015]

Ans.

S. No.	Biodegradable Substance	Non-biodegradable Substance
(i)	The substance which are broken down into simpler, harmless substance in nature in due course of time by the biological processes such as action of microorganisms.	The substances which cannot be broken down into simpler, harmless substances in nature. These substances may be in solid, liquid or gaseous form and may be inert and accumulate in the environment.
(ii)	e.g., Domestic waste products, sewage.	e.g., DDT and polythene bags.

Two methods of disposal of non-biodegradable waste are:

- Recycling:** The wastes are treated and same value materials are extracted for reuse.
- Incineration:** Medical and toxic waste are burnt at high temperature in incineration. Incinerators transform the waste into ashes. 2+1



Long Answer Type Questions

5 marks each

Q. 1. Name the wastes which are generated in your house daily. What measures would you take for their disposal? [A] [NCERT Exemp.]

Ans. The wastes which are generated in our house daily are :

(i) Paper wastes like newspapers, bags, kitchen wastes, etc.

(ii) Plastic bags.

(iii) Vegetable or fruit peels. 2

Measures taken for proper disposal are:

(i) Prepare a compost pit for kitchen wastes.

(ii) Safe disposal of plastic bags.

(iii) Segregation of biodegradable and non-biodegradable wastes.

(vi) Fruit peels can be placed near trees or plants, which on decomposition will enrich the soil with nutrients.

(v) Recycling of paper wastes. (Any three) 3

Q. 2. Suggest suitable mechanisms for waste management in fertiliser industries.

[A] [NCERT Exemp.]

Ans. Effluents and harmful gases are the major pollutants which are generated in a fertiliser, chemical or pesticides factory. Scientific mechanism for reduction in emission of pollutants in environment is :

For reduction of gaseous pollutants, electro-static precipitators (ESP) are commonly used. ESP works on the principle of "opposite charges attract." When the gaseous emissions containing unburnt pollutants such as coal particles, unburnt carbon, SO_x , NO_x , etc. enters this field, ash particles gets charged and attracted towards the collecting plates due to the force produced by the electric field. Thereby, reducing the gaseous emissions in the atmosphere. 2½

In addition to this, industrial waste water generated from the fertiliser industry contains pollutants that may contaminate our natural water resources. For safe disposal of industrial waste water, effluent treatment plant (ETP) is set up to treat the waste water. An ETP is used to purify water and remove any toxic and non-toxic materials or chemicals from it. They use evaporation and drying methods, and other auxiliary techniques such as centrifuging, filtration, incineration for chemical processing and effluent treatment. The treated water can be used in the industrial process and for irrigation of plantation. 2½

Q. 3. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage? [R] [NCERT Ex.]

Ans. Ozone layer is a protective shield around the Earth. It prevents harmful ultraviolet radiation of the Sun from reaching the Earth. Air pollutants, like chlorofluorocarbons (CFCs), are causing depletion of ozone layer.

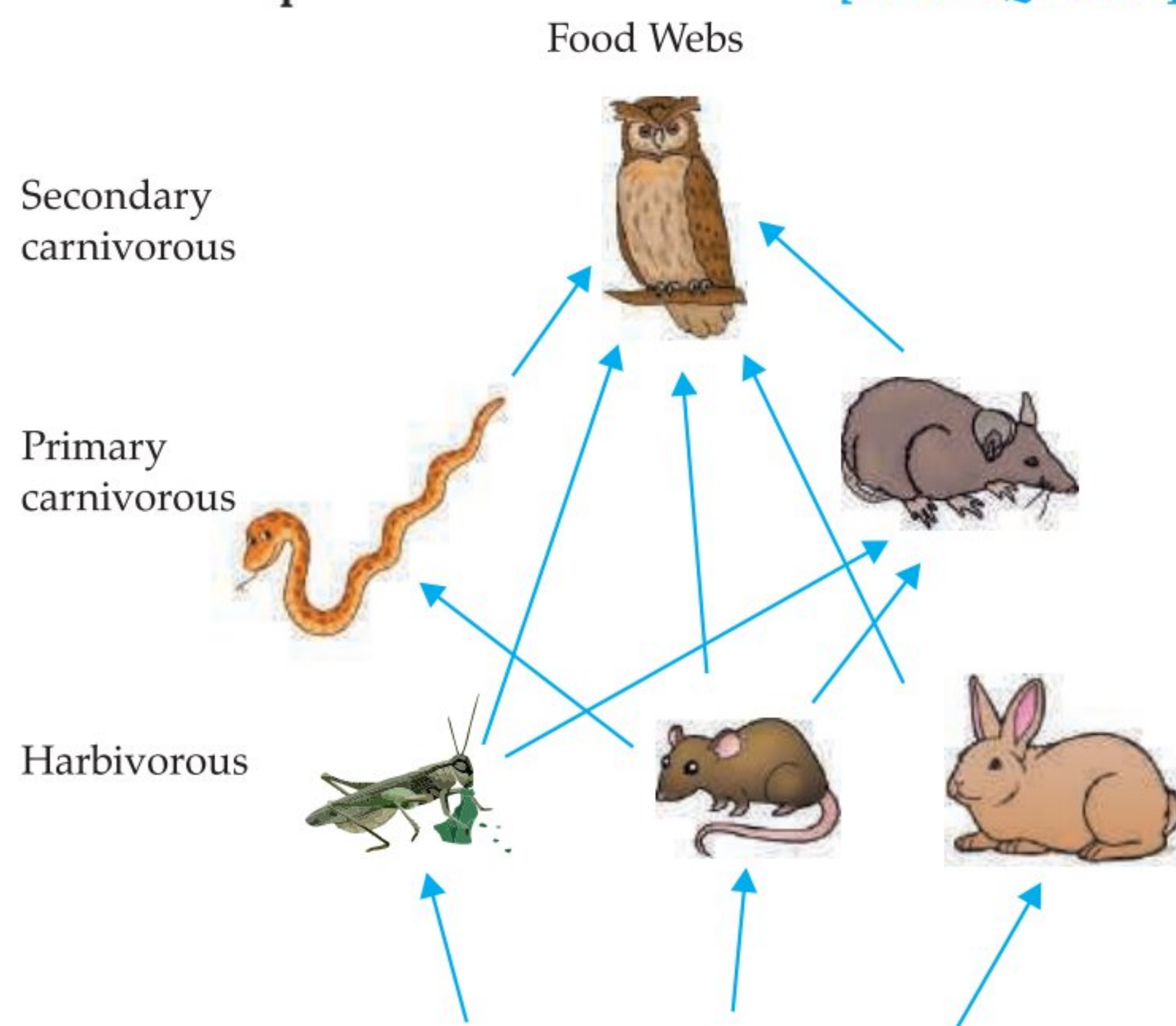
Depletion of ozone layer is allowing greater amount of UV radiation to reach the Earth. UV radiation can affect the ecosystem by affecting photosynthesis in

plants, destroying planktons and decomposers. In human beings, UV radiation may cause skin cancer, cataract and damage to immune system.

Many developed as well as developing nations of the world have agreed to sign and obey the directions of UNEP (United Nations Environment Programme) to cease the production of CFCs or to limit their production to some extent. 5

Visual Case-based Questions 4 marks each

Q.1. Read the following and answer any four the questions from (a) to (e):
Food chains are very important for the survival of most species. [CBSE–QB 2021]



- (a) If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?
 - (i) 10,000 J
 - (ii) 100 J
 - (iii) 1000 J
 - (iv) It will depend on the type of the terrestrial plant.
- (b) If Ravi is consuming curd/yogurt for lunch, which trophic level in a food chain he should be considered as occupying ?
 - (i) First trophic level (ii) Second trophic level
 - (iii) Third trophic level (iv) Fourth trophic level
- (c) The decomposers are not included in the food chain. The correct reason for the same is because decomposers:
 - (i) Act at every trophic level of the food chain
 - (ii) Do not breakdown organic compounds
 - (iii) Convert organic material to inorganic forms
 - (iv) Release enzymes outside their body to convert organic material to inorganic forms
- (d) Matter and energy are two fundamental inputs of an ecosystem. Movement of
 - (i) Energy is bidirectional and matter is repeatedly circulating.

- (ii) Energy is repeatedly circulation and matter is unidirectional.
- (iii) Energy is unidirectional and matter is repeatedly circulating.
- (iv) Energy is multidirectional and matter is bidirectional.

(e) Which of the following limits the number of trophic levels in a food chain?

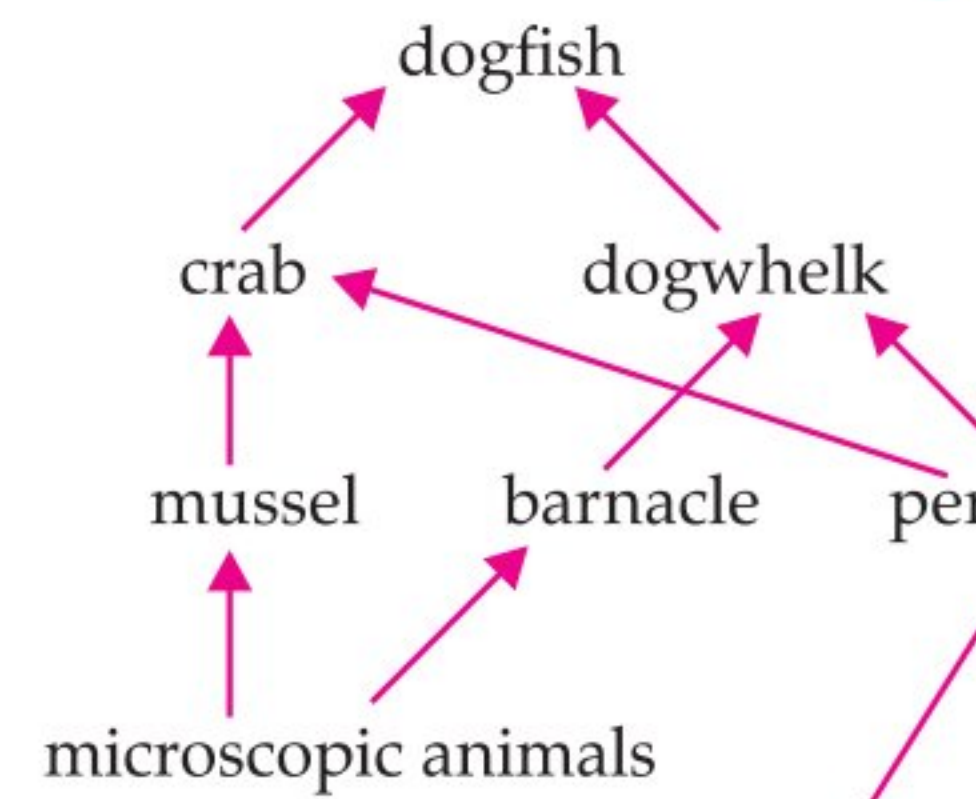
- (i) Decrease in energy at higher trophic levels
- (ii) Less availability of food
- (iii) Polluted air
- (iv) Water

Ans. (a) (ii) 100 J

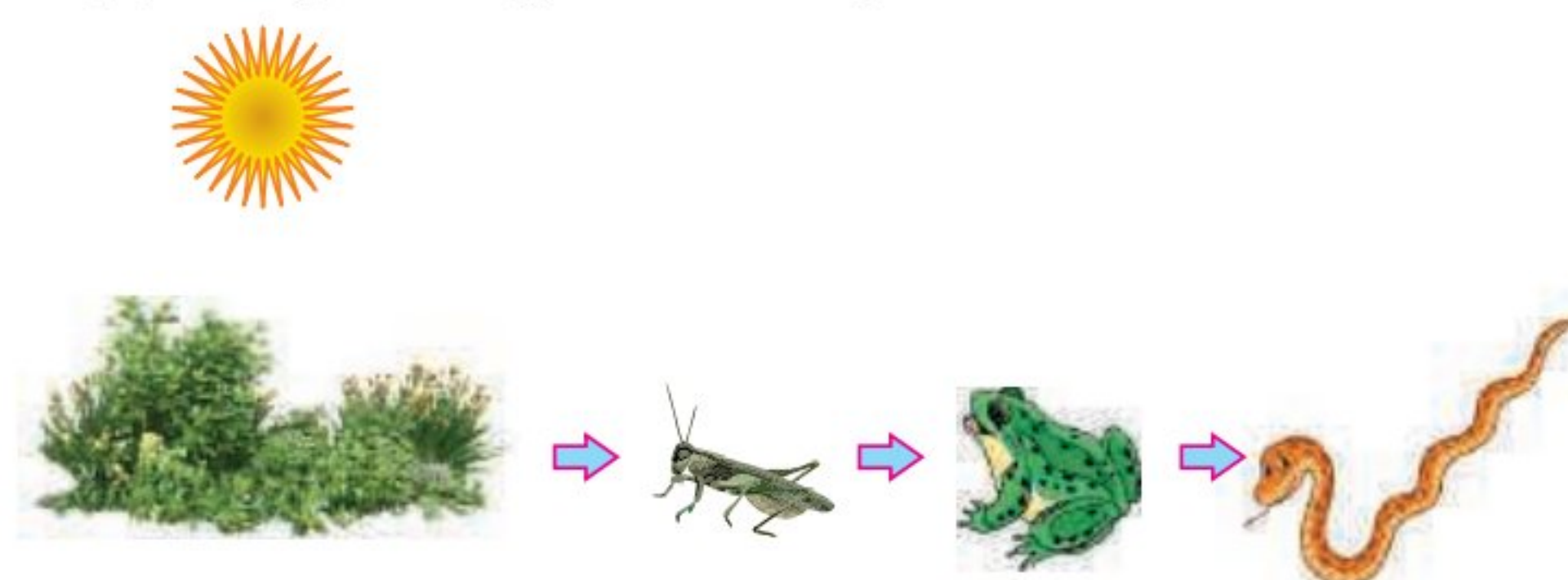
- (b) (iii) Third Trophic level
- (c) (i) Act at every trophic level of the food chain
- (d) (iii) Energy is unidirectional and matter is repeatedly circulating
- (e) (i) Decrease in energy at higher trophic level

Q.2. Read the following and answer any four questions from (a) to (e):

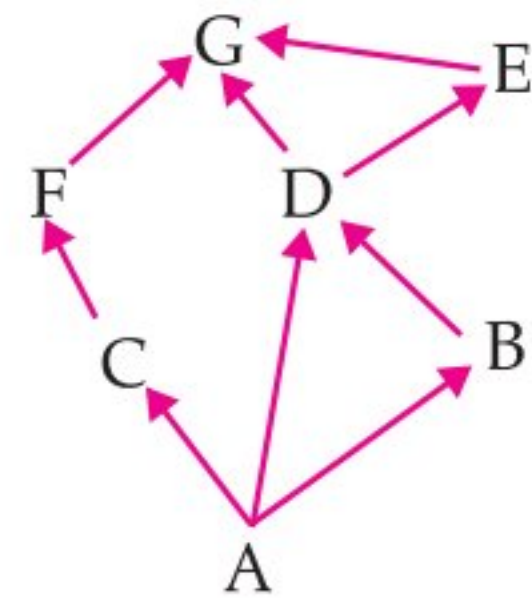
Observe the food web and answer the questions given below - [CBSE–QB 2021]



- (a) The mussel can be described as
 - (i) Producer
 - (ii) Primary consumer
 - (iii) Secondary consumer
 - (iv) decomposer
- (b) Which trophic level is incorrectly defined?
 - (i) Carnivores – secondary or tertiary consumers
 - (ii) Decomposers – microbial heterotrophs
 - (iii) Herbivores – primary consumers
 - (iv) Omnivores – molds, yeast and mushrooms
- (c) The given figure best represents:



- (i) Grassland food chain (ii) Parasitic food chain
 (iii) Forest food chain (iv) Aquatic food chain
- (d) Why do all food chains start with plants?
 (i) Because plants are easily grown
 (ii) Because plants are nutritious
 (iii) Because plants can produce its own energy
 (iv) Because plants do not require energy
- (e) In the food web, which two organisms are competing for food?



- (i) A and B (iii) A and C
 (ii) D and F (iv) B and D

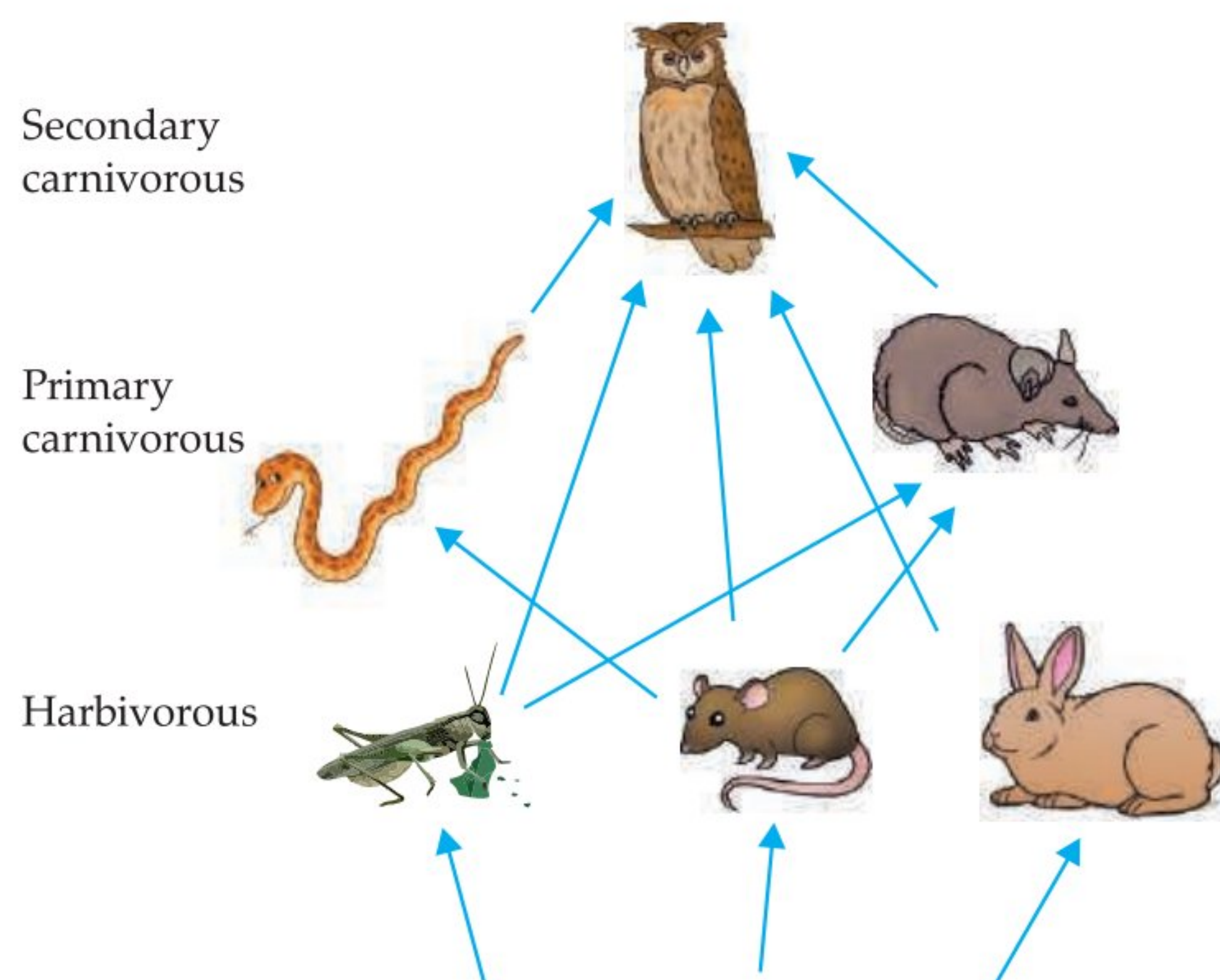
- Ans. (a) (iii) Secondary consumer
 (b) (iv) Omnivores
 (c) (i) Grassland food chain
 (d) (iii) Because plants can produce its own energy
 (e) (iv) (B) & (D)

Q. 3. Read the following and answer any four questions from (a) to (e) [CBSE-QB 2021]

Food chains are very important for the survival of most species. When only one element is removed from the food chain it can result in extinction of a species in some cases. The foundation of the food chain consists of primary producers.

Primary producers, or autotrophs, can use either solar energy or chemical energy to create complex organic compounds, whereas species at higher trophic levels cannot and so must consume producers or other life that itself consumes producers. Because the sun's light is necessary for photosynthesis, most life could not exist if the sun disappeared. Even so, it has recently been discovered that there are some forms of life, chemotrophs, that appear to gain all their metabolic energy from chemosynthesis driven by hydrothermal vents, thus showing that some life may not require solar energy to thrive.

Food Webs



- (a) If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?
 (i) 10,000 J
 (ii) 100 J
 (iii) 1000 J
 (iv) It will depend on the type of the terrestrial plant.
- (b) Mr. X is eating curd/yogurt. For this food intake in a food chain he should be considered as occupying
 (i) First trophic level (ii) Second trophic level
 (iii) Third trophic level (iv) Fourth trophic level
- (c) The decomposers are not included in the food chain.

The correct reason for the same is because decomposers:

- (i) Act at every trophic level of the food chain
 (ii) Do not breakdown organic compounds
 (iii) Convert organic material to inorganic forms
 (iv) Release enzymes outside their body to convert organic material to inorganic forms

(d) Matter and energy are two fundamental inputs of an ecosystem. Movement of

- (i) Energy is bidirectional and matter is repeatedly circulating.
 (ii) Energy is repeatedly circulation and matter is unidirectional.
 (iii) Energy is unidirectional and matter is repeatedly circulating.
 (iv) Energy is multidirectional and matter is bidirectional.

(e) Which of the following limits the number of trophic levels in a food chain?

- (i) Decrease in energy at higher trophic levels
 (ii) Less availability of food
 (iii) Polluted air
 (iv) Water

Ans. (a) (ii) 100 J

- (b) (iii) Third Trophic level
 (c) (i) Act at every trophic level of the food chain
 (d) (iii) Energy is unidirectional and matter is repeatedly circulating
 (e) (i) Decrease in energy at higher trophic level

Q. 4. Read the following and answer the questions any four from (a) to (e): [CBSE-QB 2021]

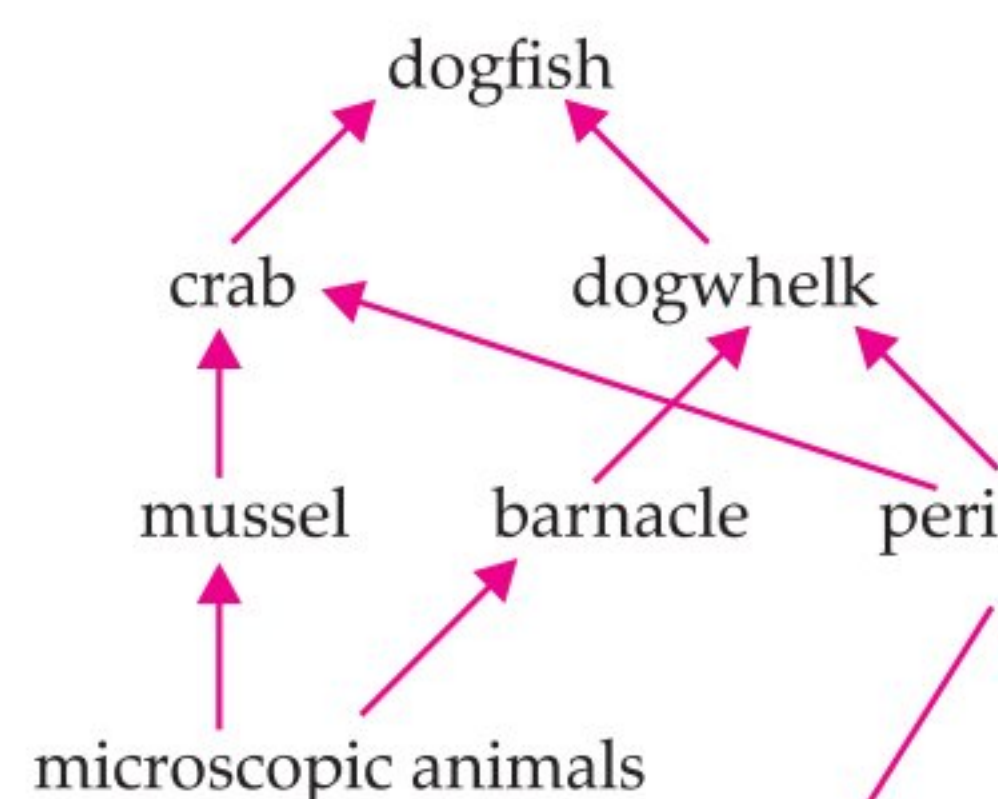
Biosphere is a global ecosystem composed of living organisms and abiotic factors from which they derive energy and nutrients. And ecosystem is defined as structural and functional unit of the biosphere comprising of living and non-living environment that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable, self-supporting system.

Biotic vs. Abiotic Factors

Living	Non-Living
Examples	Examples

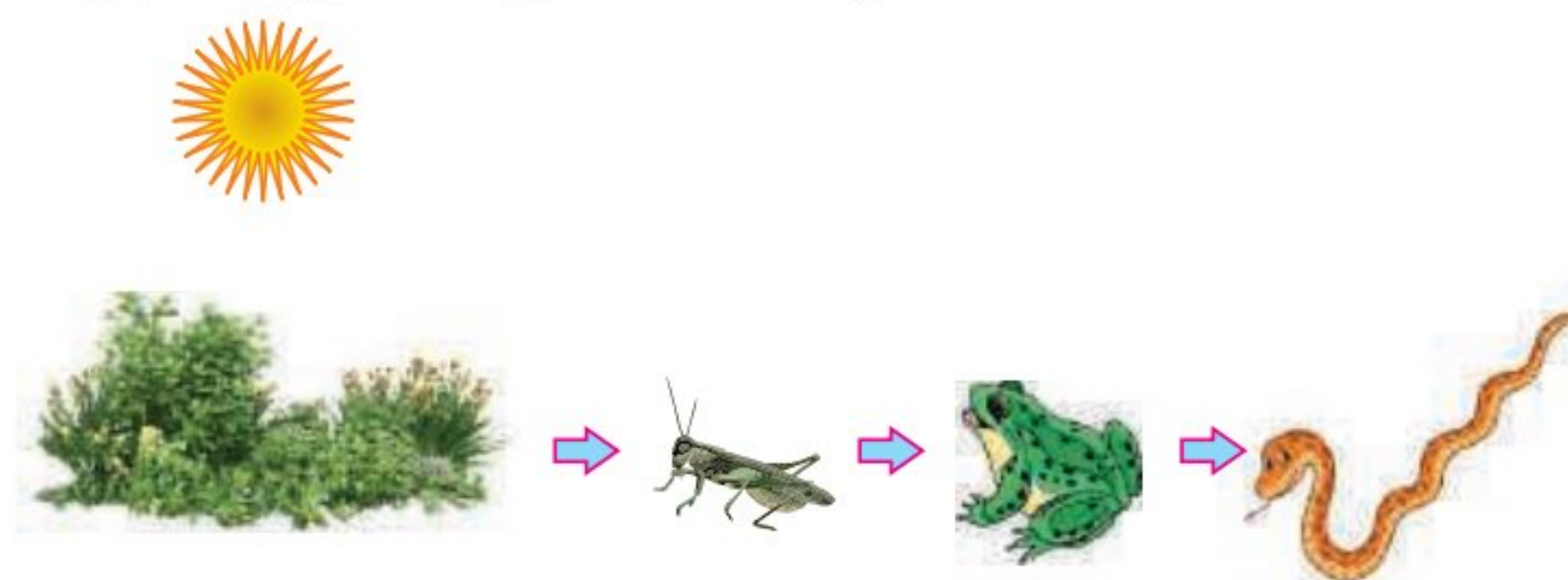
Plants	Water
Animals	Sunlight
Fungi	Soil
Bacteria	Air
	Temperatu

- (a) Which trophic level is incorrectly defined?
 (i) Carnivores – secondary or tertiary consumers
 (ii) Decomposers – microbial heterotrophs
 (iii) Herbivores – primary consumers
 (iv) Omnivores – molds, yeast and mushrooms
- (b) The diagram below shows a food web from the sea shore



The mussel can be described as

- (i) Producer (ii) Primary consumer
 (iii) Secondary consumer (iv) Decomposer
- (c) The given figure best represents:



- (i) Grassland food chain (ii) Parasitic food chain
 (iii) Forest food chain (iv) Aquatic food chain
- (d) Consider the following statements concerning food chains:
 (i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation
 (ii) Removal of most of the carnivores resulted in an increased population of herbivores.
 (iii) The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss

- (c) According to the 'Solid Waste Management Rule 2016', the waste should be segregated into three categories. Observe the table below and select the row that has correct information

	Wet waste	Dry waste	Hazardous waste
(i)	Cooked food, vegetable peels	Used bulbs, fluorescent lamps	Plastic carry bags, bottles, newspaper, cardboard
(ii)	Coffee and tea powder, garden waste	Plastic carry bags, bottles, newspaper, cardboard	Expired medicines, razors, paint cans
(iii)	Leftover food, vegetable peels	Coffee and tea powder, garden waste	Insect repellents, cleaning solutions
(iv)	Uncooked food, tea leaves	Old crockery, frying pans	Coffee and tea powder, garden waste

- (iv) The length of the food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?

- (1) (i), (iv) (2) (i), (ii)
 (3) (ii), (iii) (4) (iii), (iv)

- (e) Which of the following group of organisms are not included in ecological food chain?

- (i) Carnivores (ii) Saprophytes
 (iii) Herbivores (iv) Predators

- Ans. (a) (iv) Omnivores – molds, yeast and mushrooms
 (b) (iii) Secondary consumer
 (c) (i) Grassland food chain
 (d) (iii) (2), (3)
 (e) (ii) Saprophytes

Q. 5. Waste management is essential in today's society. Due to an increase in population, the generation of waste is getting doubled day by day. Moreover, the increase in waste is affecting the lives of many people. [CBSE-QB 2021]

Waste management is the managing of waste by disposal and recycling of it. Moreover, waste management needs proper techniques keeping in mind the environmental situations. For instance, there are various methods and techniques by which the waste is disposed of. You must have come across 5 R's to save the environment: refuse, reduce, reuse, repurpose and recycle.

- (a) Choose the waste management strategy that is matched with correct example.

(i)	Refuse	Choose products that use less packaging
(ii)	Reduce	Give unwanted toys and books to hospitals or schools
(iii)	Reuse	Not using single use plastic
(iv)	Repurpose	Making flower pot from used plastic bottle

- (b) Recycling of paper is a good practice but recycled paper should not be used as food packaging because

- (i) recycled papers take lots of space
 (ii) recycled papers can't cover food properly
 (iii) recycled papers can cause infection
 (iv) recycled papers are costly

(d) Effective segregation of wastes at the point of generation is very important. Select the appropriate statements giving the importance of waste segregation.

- (1) less waste goes to the landfills
- (2) better for public health and the environment
- (3) help in reducing the waste
- (4) resulting in deterioration of a waste picker's health

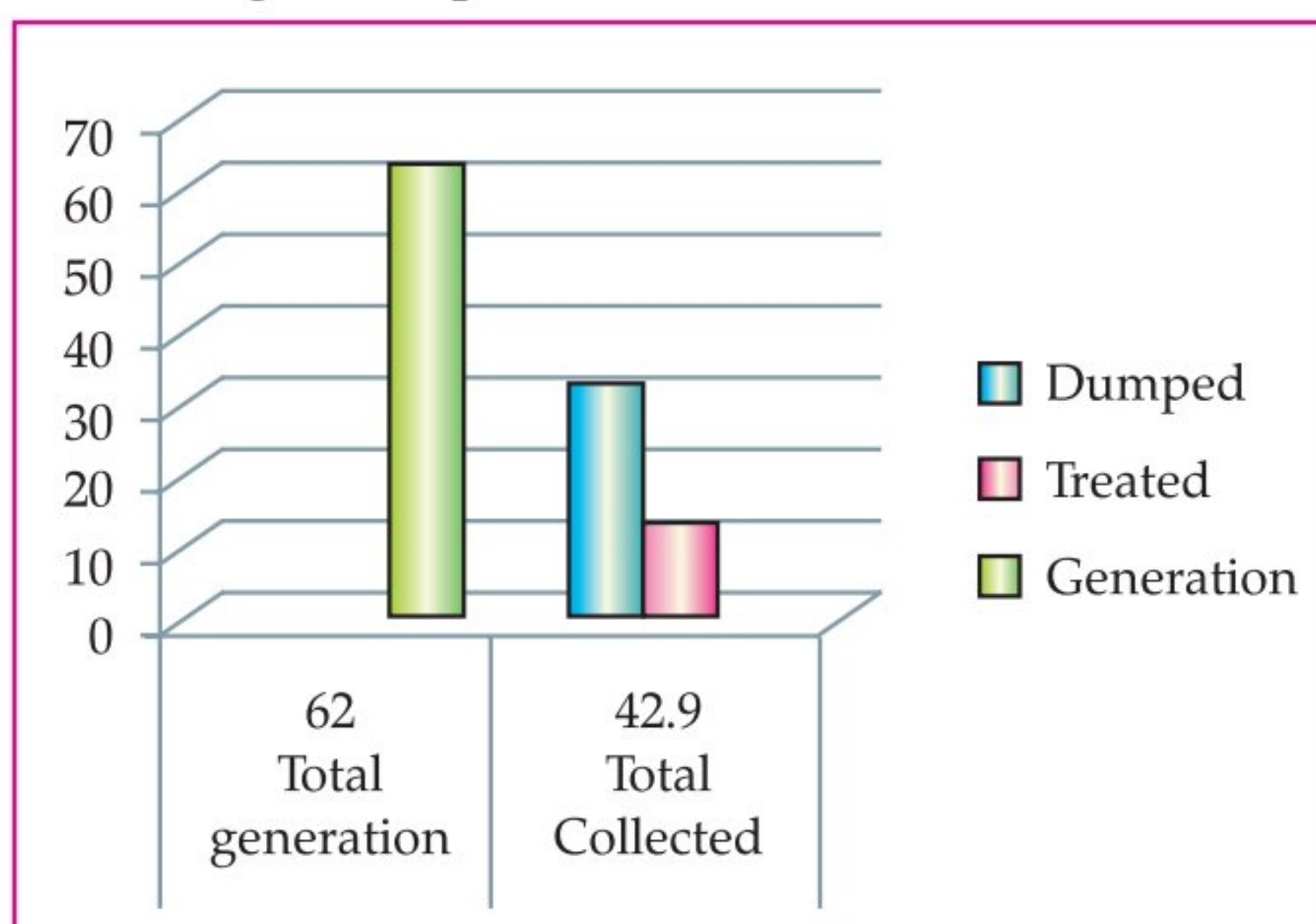
(i) both (1) and (2)

(ii) both (1) and (3)

(iii) both (2) and (3)

(iv) both (1) and (4)

(e) The given graph shows the amount of waste generated, dumped and treated in percentage. Identify the reason of low success rate of waste management process.



(i) only 15% of urban India's waste is processed

(ii) less than 60% of waste is collected from households

(iii) more than 60% of waste is collected from households

(iv) both a and b

Ans. (a) (iv)

(b) (iii)

(c) (ii)

(d) (i)

(e) (iv)

Q. 6. Read the following passage and answer any four questions from (a) to (e).

Human body is made up of five important components, of which water is the main component. Food as well as potable water is essential for every human being. The food is obtained from plants through agriculture; Pesticides are being used extensively for a high yield in the fields. These pesticides are absorbed by the plants from the soil along with water and minerals and from the water bodies these pesticides are taken up by the aquatic animals and plants. As these chemicals are not biodegradable, they get accumulated progressively at each trophic level. The maximum concentration of these chemicals gets accumulated in our bodies and greatly affects the health of our mind and body.

(a) Why is the maximum concentration of pesticides found in human beings?

(b) Give one method which could be applied to reduce our intake of pesticides through food to some extent.

(c) Various steps in a food chain represent:

(i) Food web

(ii) Trophic level

(iii) Ecosystem

(iv) Biomagnification

(d) With regard to various food chains operating in an ecosystem, man is a:

(i) Consumer

(ii) Producer

(iii) Producer and consumer

(iv) Producer and decomposer

[A] [Delhi, Set-I, 2020]

Ans. (a) It is because humans are at the top of the food chain and due to biomagnification, the concentration of pesticides increases as one goes up the trophic levels.

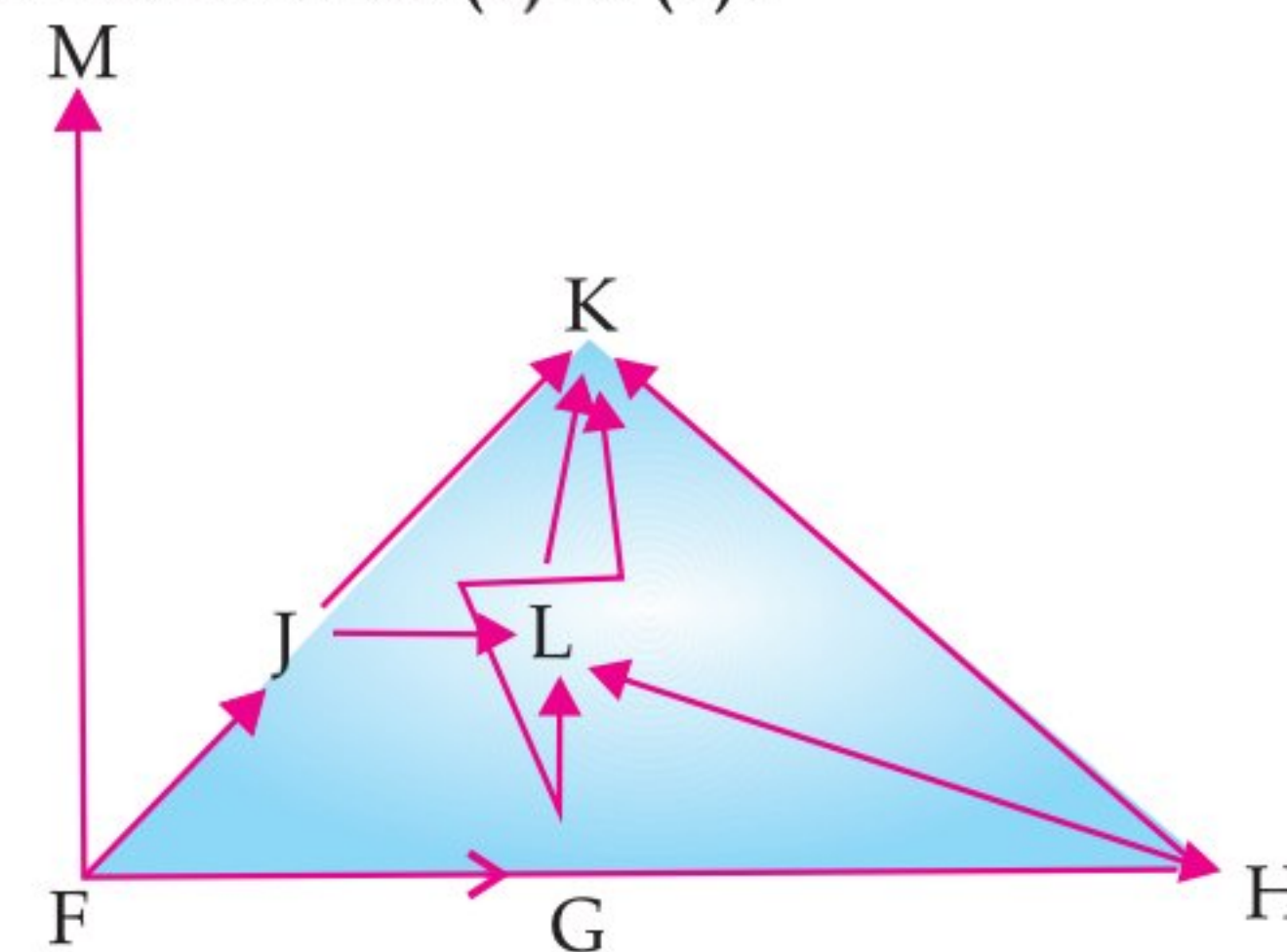
(b) Organic farming should be done or more bio-pesticides should be used.

(c) (b) Trophic level

(d) (a) Consumer

1 × 4 = 4

Q. 7. Study the following food web and answer any four questions from (a) to (e).



(a) Which of these is the producer?

(i) K

(ii) L

(iii) J

(iv) F

(b) Which organisms are primary consumers?

(i) F, L, H, K

(ii) M, G, J, H

(iii) J, L, K, M

(iv) F, K, M, H

(c) Which organisms will receive maximum energy in the ecosystem?

(i) M

(ii) K

(iii) F

(iv) None of these

(d) Which organisms represent top level carnivores?

(i) K

(ii) M

(iii) G

(iv) Both (i) and (ii)

(e) What will happen if we kill all the organisms in one trophic level?

(i) Population of organisms in previous trophic level will increase.

(ii) Population of organism in previous trophic level will decrease.

- (iii) Population of organism in next trophic level will increase.
- (iv) This will not affect the population of any trophic level.

Ans. (a) (iv) F is the producer.

(b) (ii) M, G, J, H

(c) (iii) F

(d) (iv) K

(e) (iii) If we kill all the organisms in one trophic level, the population of organisms in next trophic level will increase. (Any four) 1 + 1 + 1 + 1

Q. 8. Read the following passage given below and answer the any of the four questions from (a) to (e).

A water body characterized by nutrient rich water supports abundant growth of phytoplanktons and other water plants on its surface. Over time, the water body gets filled with a large number of such plants and the process is called *Eutrophication*. In such water bodies, dissolved oxygen content is nil or very less.

- (a) Eutrophicated water usually looks turbid green in colour because of
 - (i) Excessive growth of phytoplanktons
 - (ii) Accumulation of minerals and nutrients
 - (iii) Water body becoming polluted
 - (iv) Release of degraded plant chlorophyll in water
- (b) In eutrophicated water body, growth rate of phytoplankton is high because of:
 - (i) Light penetrating the lower surfaces of water body
 - (ii) Enrichment of nutrients in the water body
 - (iii) Less of dissolved oxygen in the water body.
 - (iv) Aquatic fauna flourishes well in eutrophicated water body.
- (c) Aquatic fauna thrives well in eutrophicated water body because there is plenty of phytoplankton on which they could feed on. (True or False)
- (d) There is an extremely low level of dissolved oxygen in a eutrophicated water body because:
 - (i) Excessive growth of bacterial decomposers feeding on dead material which consume the dissolved oxygen
 - (ii) Plants grow to such a great extent that they do not allow free flow of water hence oxygen in the atmosphere does not get mixed with water.
 - (iii) The dissolved oxygen in water reacts with minerals and nutrients to form compounds and hence greatly reduces the quantity of oxygen.
 - (iv) Oxygen released is consumed by fishes in the eutrophicated water and hence the quantity of dissolved oxygen is very low.
- (e) We do not clean ponds or lakes, but an aquarium needs to be cleaned . Why?

Ans. (a) (i) Eutrophicated water usually looks turbid green in colour because of excessive growth of phytoplanktons.

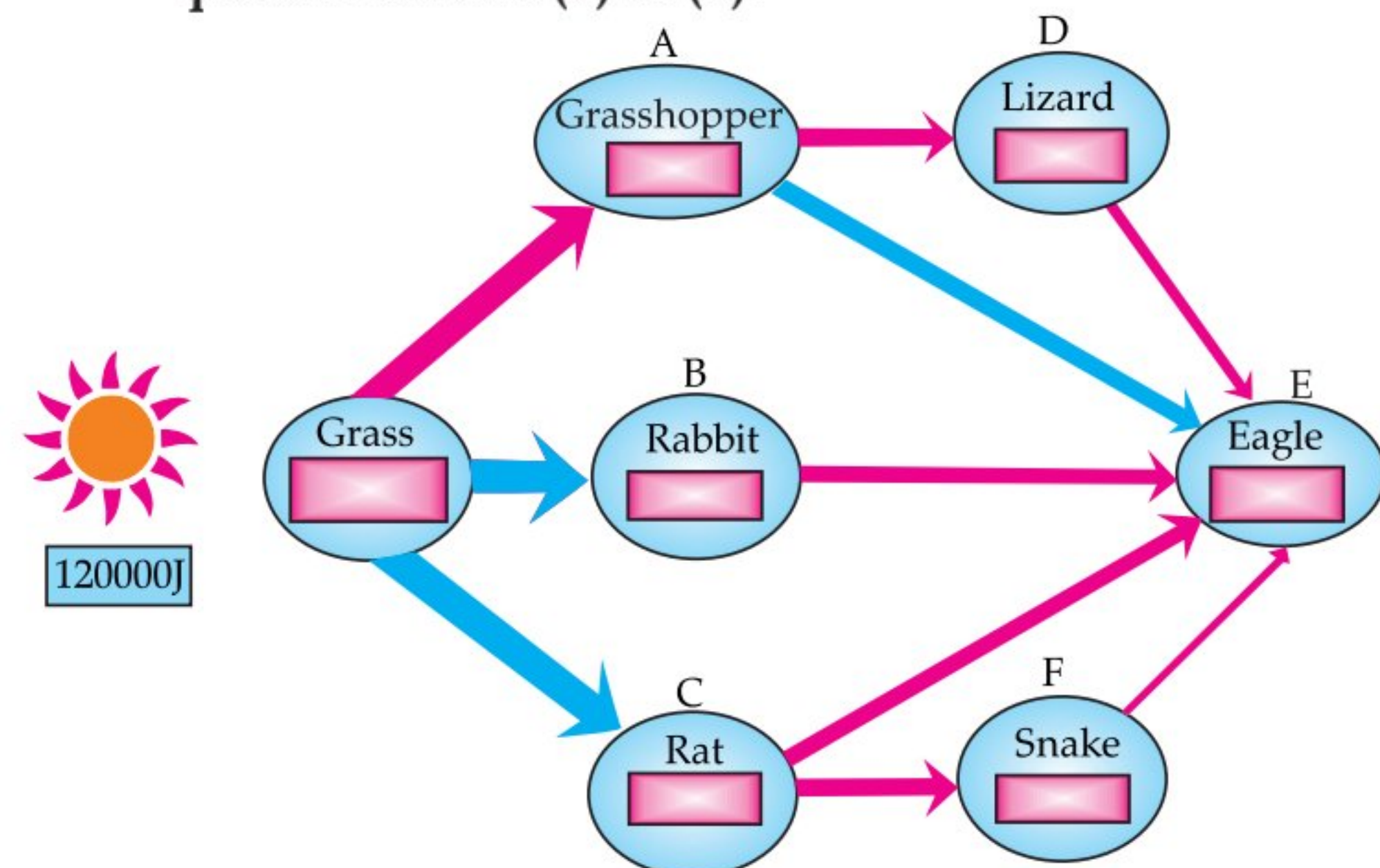
(b) (ii) In eutrophicated water body, growth rate of phytoplankton is high because of enrichment of nutrients in the water body.

(c) False.

(d) (i) There is an extremely low level of dissolved oxygen in a eutrophicated water body because excessive growth of bacterial decomposers feeding on dead material which consume the dissolved oxygen.

(e) A pond or lake is a natural ecosystem. They are self-sustaining and complete, in them, all the organisms of food chain are available. If any organism dies, there are decomposers to decompose their bodies into simpler substances. An aquarium, on the contrary is an artificial and incomplete ecosystem. The abiotic components are not supplied naturally to it. It may not have all the biotic components in it. If a fish die in an aquarium in the absence of decomposer, it will lie there as a rotten body, polluting the water of aquarium. Thus, an aquarium needs regular cleaning. (Any four) 1+1+1+1

Q. 9. Food chains and the energy flow within an ecosystem provide an important understanding of contingencies and mutual dependencies of organisms. The given below flow chart depicts the energy flow within some members of a grassland ecosystem. The grass in the below ecosystem transducer 120,000 J of sunlight and fixes it into 12,000 J of energy. It is established that 90% of the energy of one trophic level is not passed to the next trophic level. Further assume that the energy transferred from one trophic level to the next is equally shared among the different organisms at that trophic level. Based on the information given and your knowledge, answer any of the four questions from (a) to (e).



- (a) How many food chains are present in the food web depicted above?
 - (i) 2
 - (ii) 3
 - (iii) 5
 - (iv) 6
- (b) Based on the above information, indicate the amount of energy that an organism (A to F) may have received from an organism from the previous trophic level.
- (c) In the food web depicted above, identify the most energy efficient link for tertiary consumer.

- (i) Rabbit
- (ii) Rat
- (iii) Lizard
- (iv) Grasshopper

(d) The first trophic level in a food chain is always a green plant. Why?

- (e) Flow of energy in an ecosystem is always
- (i) unidirectional
 - (ii) bidirectional
 - (iii) multidirectional
 - (iv) no specific direction

Ans. (a) (iii) There are five food chains depicted in the above flow chart.

(b) A = 1200 J, B = 1200 J, C = 1200 J, D = 120 J, E = 120 J, F = 120 J

(c) (i) Tertiary consumer here is Eagle, so for eagle the most energy efficient link is rabbit, as the rabbit is not being eaten in any other food chain.

(d) Green plants are producers. The first trophic level in a food chain is producer i.e., those organisms which produce food by photosynthesis.

(e) (i) Flow of energy in an ecosystem is always unidirectional. (Any four) 1 + 1 + 1 + 1

Q. 10. Read the given passage and answer any of the four questions from (a) to (e) given below:

A farmer is growing a crop regularly in his field. He uses chemical fertilizers, pesticides, organic manure as well as bio-fertilizers. Very close to his field is a factory which emits smoke as a byproduct. There is also a huge lake in the nearby area. 4

(a) A considerable increase in plant life in the lake was noticed after the farming activity intensified. The most likely reason for this could be:

- (i) Chemical fertilizers leached into the lake from the field.
- (ii) Pesticides leached into the lake from the field.
- (iii) Organic manure leached into the lake from the field.
- (iv) Smoke particles from the industry got settled in moist surroundings of the lake.

(b) Consider the following food chain in the same lake.

Aquatic plant → Small fish → Big fish → Birds

Which of the above organisms is likely to show minimum amount of pesticide concentration in them after considerable time?

- (i) Aquatic plants.
- (ii) Small fish.
- (iii) Big fish.
- (iv) Birds.

(c) Will the levels of this magnification be different at different levels of the ecosystem?

(d) An expert agriculturist suggests to the farmer to minimize the use of chemical fertilizers and instead use biofertilizers as they have many advantages over chemical fertilizers.

Which of the following is NOT true for biofertilizers?

- (i) They are economical
- (ii) They help in reducing pollution in the lake
- (iii) They are renewable
- (iv) They require large set-up for their production.

(e) State a way to prevent accumulation of harmful chemicals in our bodies.

Ans. (a) (i) A considerable increase in plant life in the lake was noticed after the farming activity intensified. The most likely reason for this could be chemical fertilizers leached into the lake from the field.

(b) (i) Aquatic plants beings at the first trophic level will show minimum amount of pesticide concentration in them after considerable time.

(c) Yes. Biological magnification increases at each trophic level.

(d) (iv) Biofertilisers do not require large set-up for their production.

(e) Minimize the use of chemicals/pesticides in agriculture. (Any four) 1+1+1+1

Q. 11. Study the passage and answer any four questions from (a) to (e).

The activities of man had adverse effects on all forms of living organisms in the biosphere.

Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of him but also of the entire living organisms on the mother earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings.

(a) Why is it necessary to conserve our environment?

(b) The green dustbin signifies:

- (i) Non-biodegradable waste
- (ii) Biodegradable waste
- (iii) Plastic waste
- (iv) Garbage

(c) State the importance of green and blue dustbins in the safe disposal of the household waste.

(d) In the following groups of materials, which group(s) contains only non-biodegradable items?

- (I) Wood, paper, leather
- (II) Polythene, detergent, PVC
- (III) Plastic, detergent, grass
- (IV) Plastic, bakelite, DDT

(i) (III)

(ii) (IV)

(iii) (I) and (III)

(iv) (II) and (IV)

(e) Disposable plastic plates should not be used because

- (i) they are made of materials with light weight
- (ii) they are made of toxic materials
- (iii) they are made of biodegradable materials
- (iv) they are made of non-biodegradable materials

- Ans. (a) (i)** To save water, air and soil from pollution.
- (b)** Green dustbins are for biodegradable wastes while blue dustbins are for non-biodegradable wastes.
- (c) Importance of two types of dustbins:** The segregation of biodegradable and non-biodegradable wastes occurs without wasting time and energy.
- (d) (iv)** Substances which are not broken down

- by the bacteria or saprophytes are called non-biodegradable substances. Under certain conditions, the non-biodegradable substances can persist for longer time and can also harm the various components of our ecosystem.
- (e) (iv)** Disposable plastic plates should not be used because they are made of non-biodegradable materials **(Any four) 1 + 1 + 1 + 1**

Know the Terms

- **Environment:** It is the sum total of all biotic and abiotic components occurring naturally.
- **Biodegradable substances:** Substances which are broken down into simpler, harmless substances in nature in due course of time by the biological processes such as action of micro-organisms.
- **Non-biodegradable substances:** Substances which cannot be broken down into simpler, harmless substances in nature. These substances may be in solid, liquid or gaseous form and may be inert and accumulate in the environment or may concentrate in the food chain and harm the organisms.

