Case-Based Questions
(Issued by CBSE in April-2021)
SCIENCE - X

Q. 1. Read the following and answer any four questions from (a) to (e): [CBSE–QB 2021]

Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.

(a) The substance not likely to contain $CaCO_3$ is

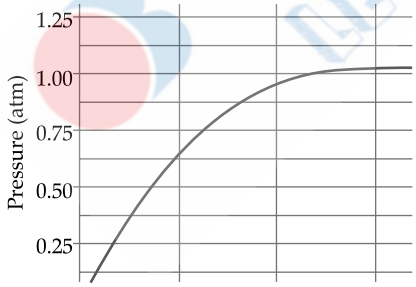
(i) Dolomite

(ii) A marble statue

(iii) Calcined gypsum

(iv) Sea shells.

(b) A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 minutes and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



(i) 15-20 min **(ii)** 10-15 min

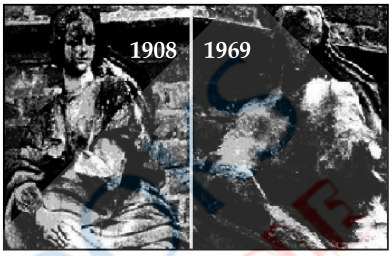
(iii) 5-10 min **(iv)** 0-5 min

(c) Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process -

(i) Respiration **(ii)** Photosynthesis

(iii) Transpiration **(iv)** Photolysis

(d) Marble statues are corroded or stained rain water. Identify the main reason



(i) decomposition of calcium carbonate to calcium oxide

(ii) polluted water is basic in nature hence it reacts with calcium carbonate

(iii) polluted water is acidic in nature hence it reacts with calcium carbonate

(iv) calcium carbonate dissolves in water to give calcium hydroxide.

(e) Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?

(i) sodium **(ii)** sodium oxide

(iii) calcium **(iv)** calcium oxide

Ans. (a) calcined gypsum contains $CaSO_4 . 1/2H_2O$

(b) 0-5 min

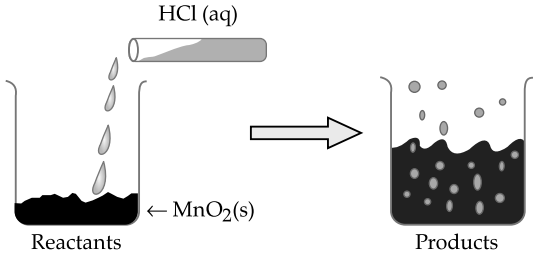
(c) photosynthesis

(d) polluted water is acidic in nature, hence it reacts with calcium carbonate

(e) calcium oxide

Q. 2. Read the following and answer any four questions from (a) to (e): [CBSE–QB 2021]

The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was released.



(a) The chemical reaction between MnO_2 and HCl is an example of:

(i) displacement reaction

(ii) combination reaction

(iii) redox reaction

(iv) decomposition reaction.

(b) Chlorine gas reacts with _____ to form bleaching powder.

(i) dry $Ca(OH)_2$

(ii) dil. solution of $Ca(OH)_2$

(iii) conc. solution of $Ca(OH)_2$

(iv) dry CaO

(c) Identify the correct statement from the following:

(i) MnO_2 is getting reduced whereas HCl is getting oxidized

(ii) MnO_2 is getting oxidized whereas HCl is getting reduced.

(iii) MnO_2 and HCl both are getting reduced.

(iv) MnO_2 and HCl both are getting oxidized.

(d) In the above discussed reaction, what is the nature of MnO_2 ?

(i) Acidic oxide **(ii)** Basic oxide

(iii) Neutral oxide **(iv)** Amphoteric oxide

(e) What will happen if we take dry HCl gas instead of aqueous solution of HCl?

(i) Reaction will occur faster.

(ii) Reaction will not occur.

(iii) Reaction rate will be slow

(iv) Reaction rate will remain the same.

Ans. (a) (iii) redox reaction

(b) (i) dry $Ca(OH)_2$

(c) (i) MnO_2 is getting reduced whereas HCl is getting oxidized

(d) (ii) Basic oxide

(e) (ii) Reaction will not occur

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

Chemistry in Automobiles:

For an internal combustion engine to move a vehicle down the road, it must convert the energy stored in the fuel into mechanical energy to drive the wheels. In your car,the distributor and battery provide this starting energy by creating an electrical "spark",which helps in combustion of fuels like gasoline. Below is the reaction depicting complete combustion of gasoline in full supply of air:

$$2C_8H_{18}(l) + 25O_2(g) \longrightarrow 16\ 'X' + Y$$

(a) Which of the following are the products obtained from the reaction mentioned in the above case?

Product 'X' Product 'Y'

(i) CO_2 H_2O_2

(ii) H_2O CO

(iii) CH_3OH H_2O

(iv) CO_2 H_2O

(b) Identify the types of chemical reaction occurring during the combustion of fuel:

(i) Oxidation & Endothermic reaction

(ii) Decomposition & Exothermic reaction

(iii) Oxidation & Exothermic reaction

(iv) Combination & Endothermic reaction

(c) On the basis of evolution/absorption of energy, which of the following processes are similar to combustion of fuel?

(i) Photosynthesis in plants

(ii) Respiration in the human body

(iii) Decomposition of vegetable matter

(iv) Decomposition of ferrous sulphate.

(1) (ii) & (iii) **(2)** (i) & (ii)

(4) (iii) & (iv) **(4)** (ii) & (i)

(d) 'A student while walking on the road observed that a cloud of black smoke belched out from the exhaust stack of moving trucks on the road.' Choose the correct reason for the production of black smoke:

(i) Limited supply of air leads to incomplete combustion of

(ii) Rich supply of air leads to complete combustion of fuel.

(iii) Rich supply of air leads to a combination reaction.

(iv) Limited supply of air leads to complete combustion of fuel.

(e) 'Although nitrogen is the most abundant gas in the atmosphere, it does not combustion'. Identify the correct reason for this statement.

(i) Nitrogen is a reactive gas

(ii) Nitrogen is an inert gas

(iii) Nitrogen is an explosive gas

(iv) Only hydrocarbons can take part in combustion

Ans. (a) (iv)

(b) (iii)

(c) (i)

(d) (i)

(e) (ii)

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

Frothing in Yamuna:

The primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, dhobi ghat Yamuna's pollution level is

so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.

(a) Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

(i) 10-11 **(ii)** 5-7

(iii) 2-5 **(iv)** 7

(b) Which of the following statements is correct for the water with detergents dissolved in it?

(i) low concentration of hydroxide ion (OH^-)and high concentration of hydronium ion (H_3O^+).

(ii) high concentration of hydroxide ion (OH^-) and low concentration of hydronium ion (H_3O^+).

(iii) high concentration of hydroxide ion (OH^-) as well as hydronium ion (H_3O^+).

(iv) equal concentration of both hydroxide ion (OH^-) and hydronium ion (H_3O^+).

(c) The table provides the pH value of four solutions P, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

(i) P>Q>R>S **(ii)** P>S>Q>R

(iii) S<Q<R<P **(iv)** S<P<Q<R

(d) High content of phosphate ion in river Yamuna may lead to:

(i) decreased level of dissolved oxygen and increased growth of algae

(ii) decreased level of dissolved oxygen and no effect of growth of algae

(iii) increased level of dissolved oxygen and increased growth of algae

(iv) decreased level of dissolved oxygen and decreased growth of algae

(e) If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?

(i) Treating the water with baking soda

(ii) Treating the water with vinegar

(iii) Treating the water with caustic soda

(iv) Treating the water with washing soda

Ans. (a) (i)

(b) (ii)

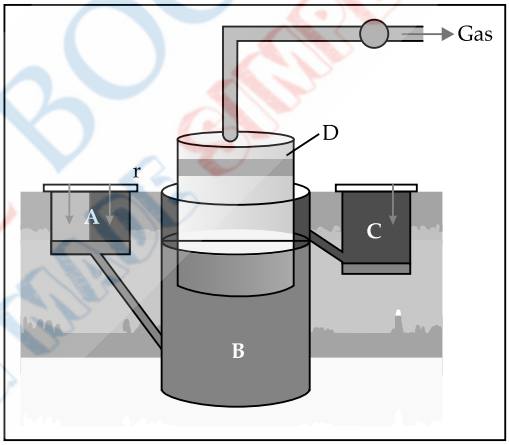
(c) (iii)

(d) (i)

(e) (ii)

Q. 5. Read the following and answer any four questions from (a) to (e) that follow on the basis of information provided and studied concepts.

A biogas plant is where biogas is produced by fermenting biomass. **[CBSE–QB 2021]**



(a) In which of the parts would you find anaerobic bacteria

(i) A **(ii)** B

(iii) C **(iv)** D

(b) Which one of the following is NOT correct for biogas

(i) its carbon neutral

(ii) its non-renewable

(iii) it depends on micro-organisms

(iv) yields rich manure

(c) Which of the following best indicates the steps of

(i) Waste water feed → biogas storage → generator → biogas

(ii) Waste water feed → digester → biogas → biogas storage → generator

(iii) Generator → waste water feed → digester → biogas → biogas storage

(iv) Waste water feed → biogas → digester → biogas storage → generator

(d) Biogas is a better fuel than animal dung cake because

(1) Biogas is a renewable source of energy

(2) Animal dung cake has higher calorific value

(3) Biogas has high heating capacity

(4) Biogas burns without smoke.

(i) (1) only **(ii)** (2) only

(iii) (3) and (4) **(iv)** (1) and (2)

(e) Biogas is formed in the

(i) presence of air only

(ii) presence of water only

(iii) presence of air and absence of water

(iv) presence of water and absence of air.

Ans. (a) (ii) B

(b) (ii) its non-renewable

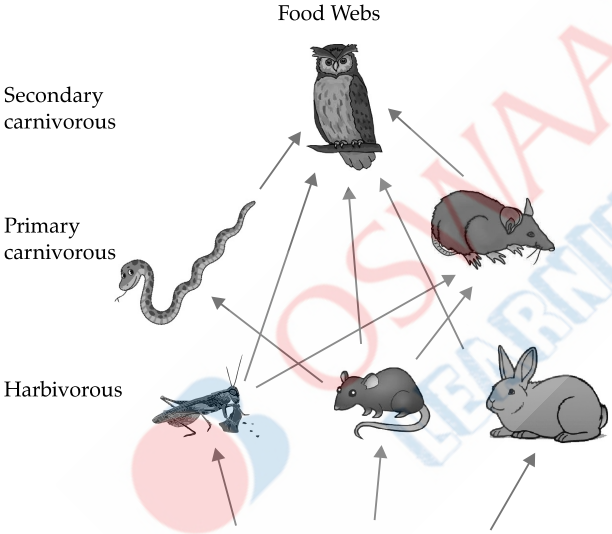
(c) (ii) Waste water feed → digester → biogas → biogas storage → generator

(d) (iii) (3) and (4)

(e) (iv) presence of water and absence of air

Q. 6. 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

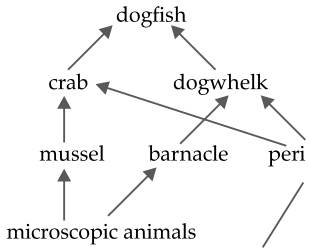
(c) (i) Act at every trophic level of the food chain

(d) (iii) Energy is unidirectional and matter is repeatedly circulating

(e) (i) Decrease in energy at higher trophic level

Q. 7. 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?

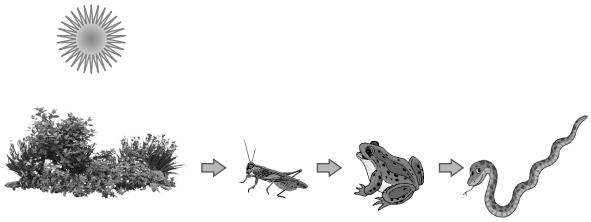
(i) Carnivores – secondary or tertiary consumers

(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?

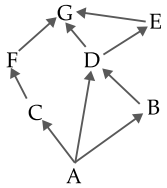
(i) Because plants are easily grown

(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

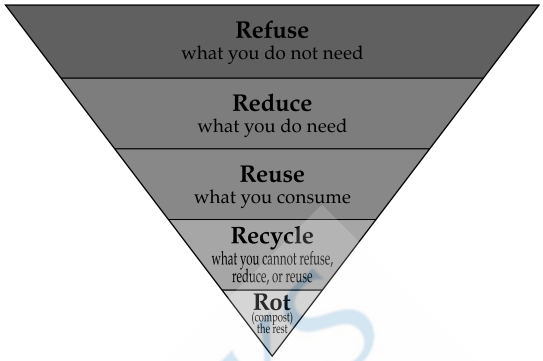
(c) (i) Grassland food chain

(d) (iii) Because plants can produce its own energy

(e) (iv) (B) & (D)

Q. 8. Observe the following diagram and answer any four questions from (a) to (e):

[CBSE–QB 2021]



(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 may release color /dyes on food items

(ii) recycled papers are not absorbent

(iii) recycled papers can cause infection due to release of methane

(iv) recycled papers are costly

(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

(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) When recycling a plastic water bottle, what should you do with the cap?

(i) The cap goes into a garbage can and the bottle

goes in a recycling bin

(ii) Screw the cap back on the bottle, then put the bottle and cap in a recycling bin

(iii) Screw the cap back on the bottle, then put the bottle and cap in the garbage can

(iv) Recycle the cap separately.

Ans. **(a)** (iv) Repurpose - Making flower pot from used plastic bottle

(b) (iii) recycled papers can cause infection due to release of methane

(c) (ii) Coffee and tea powder, garden waste

(d) (iii) both (2) and (3)

(e) (i) The cap goes into a garbage can and the bottle goes in a recycling bin

Q. 9. Read the following and answer any FOUR questions from 9.1 to 9.5 that follow on the basis of information provided and studied concepts.

[CBSE–QB 2021]

In Kunjpura village, located in Karnal district, Haryana, AdityaAggarwal and his older brother AmitAggarwal run Tee Cee Industries, a steel plant set up by their ancestors in 1984. Along with this, they also run a gaushala that houses 1,200 cows that can no longer produce milk.

The cow shelter was manageable but running the steel plant was turning out to be expensive because they spent a whopping Rs 5 lakh every month on electricity.

The brothers struck upon an idea. Why not run the factory with the biogas produced from cow dung The brothers struck upon an idea. Why not run the factory with the biogas produced from cow dung from the shelter and other gaushalas, along with bio and agri-waste like sewage, farm waste, etc. This led Aditya and Amit to start Amrit Fertilisers, a biogas project, in 2014, without any government support.

(a) Biogas is a mixture of the following gases.

(i) Ethane, Carbon monoxide, Nitrogen and Butane

(ii) Methane, Hydrogen, Carbon dioxide and Nitrogen

(iii) Butane, Carbon monoxide, Propane and Hydrogen

(iv) Carbon monoxide, Sulphur dioxide and Hydrogen

(b) Raw material used in bio gas plant is

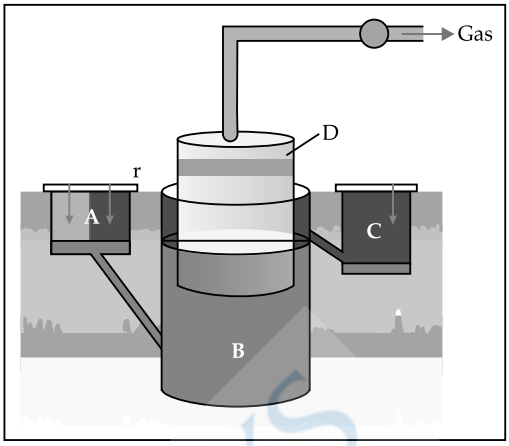
(i) Animal dung

(ii) crop residue

(iii) Food waste

(iv) All of the above

(c) The correct labelling in a biogas plant is given in



(i) A- Manure B-slurry C-Gas tank D-Digester

(ii) A- Slurry B-Digester C-Manure D- Gas tank

(iii) A-Gas tank B-Manure C-Digester D- Slurry

(iv) A- Digester B-Gas tank C-Slurry D-Manure.

(d) Biogas is a better fuel than animal dung cake because

(1) Biogas has lower calorific value.

(2) Animal dung cake has higher calorific value.

(3) Biogas has high heating capacity.

(4) Biogas burns without smoke.

(i) (1) only **(ii)** (2) only

(iii) (3) and (4) **(iv)** (1) and (2)

(e) Biogas is formed in the

(i) presence of air only.

(ii) presence of water only.

(iii) absence of air only.

(iv) presence of water and absence of air.

Ans.(a) **(ii)** Methane, Hydrogen, Carbon dioxide and Nitrogen

(b) **(iv)** All of the above

(c) **(ii)** A- Slurry B-Digester C-Manure D- Gas tank

(d) **(iv)** Biogas burns without smoke.

(e) **(iv)** presence of water and absence of air.

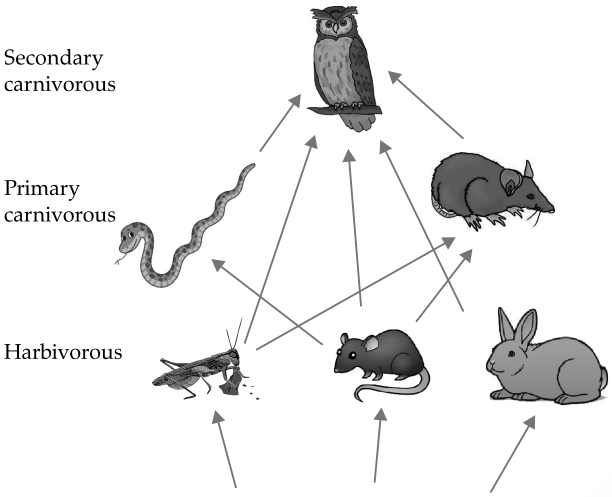
Q. 10. Read the following and answer any four questions from (a) to (e) **[CBSE–QB 2021]**

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 chemosythesis 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. 11. 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?

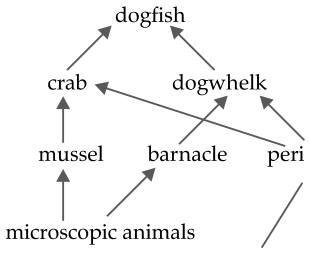
(i) Carnivores – secondary or tertiary consumers

(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

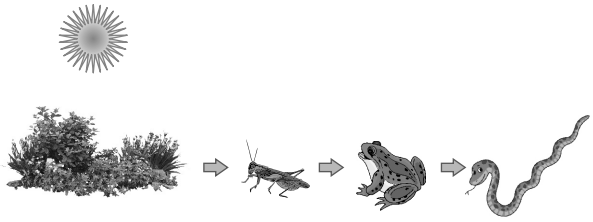


The mussel can be described as

(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:

(1) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation

(2) Removal of most of the carnivores resulted in an increased population of herbivores.

(3) The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss

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

Which two of the above statements are correct?

(i) (1), (4) **(ii)** (1), (2)

(iii) (2), (3) **(iv)** (3), (4)

(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. 12. 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

(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

(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

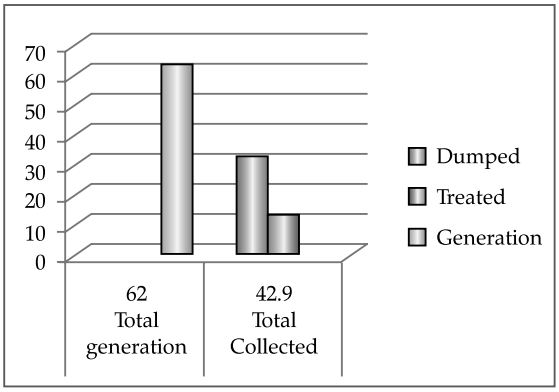
(i) both (1) and (2)

(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) Repurpose - Making flower pot from used plastic bottle

(b) (iii) recycled papers can cause infection

(c) (ii) Coffee and tea powder, garden waste

(d) (i) both (1) and (2)

(e) (iv) both a and b

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