

## SCIENCE- Class X Sample Case Studies

1. Read the following and answer any four questions from 1.1 to 1.5:

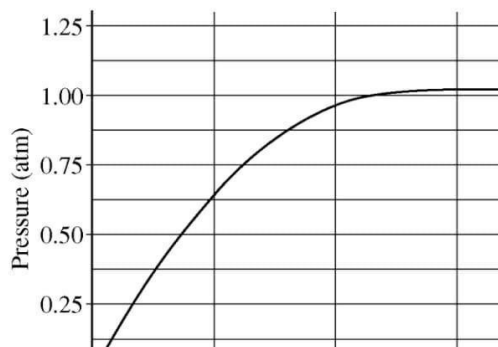
Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.



1.1 The substance not likely to contain  $\text{CaCO}_3$  is

- a) Dolomite
- b) A marble statue
- c) Calcined gypsum
- d) Sea shells.

1.2 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 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition take place?



- a) 15-20 min
- b) 10-15 min
- c) 5-10 min
- d) 0-5 min

1.3 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 -

- a) Respiration
- b) Photosynthesis
- c) Transpiration
- d) sphotolysis

1.4 Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.



- a) decomposition of calcium carbonate to calcium oxide
- b) polluted water is basic in nature hence it reacts with calcium carbonate
- c) polluted water is acidic in nature hence it reacts with calcium carbonate
- d) calcium carbonate dissolves in water to give calcium hydroxide.

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

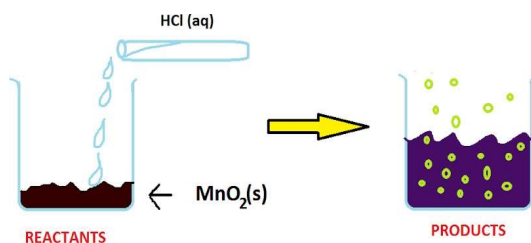
- a) Sodium
- b) sodium oxide
- c) calcium
- d) calcium oxide

<b>Answer Key</b>	1.1 white precipitate is obtained 1.2 0-5 min 1.3 photosynthesis 1.4 polluted water is acidic in nature hence it reacts with calcium carbonate 1.5 calcium oxide
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2. Read the following and answer any **four** questions from 2.1 to 2.5:

The reaction between  $\text{MnO}_2$  with  $\text{HCl}$  is depicted in the following diagram. It was observed that a gas with bleaching abilities was released .



2.1 The chemical reaction between  $\text{MnO}_2$  and  $\text{HCl}$  is an example of:

- a) displacement reaction
- b) combination reaction
- c) redox reaction
- d) decomposition reaction.

2.2 Chlorine gas reacts with \_\_\_\_\_ to form bleaching powder.

- a) dry  $\text{Ca(OH)}_2$
- b) dil. solution of  $\text{Ca(OH)}_2$
- c) conc. solution of  $\text{Ca(OH)}_2$
- d) dry  $\text{CaO}$

2.3 Identify the correct statement from the following:

MnO<sub>2</sub> is getting reduced whereas HCl is getting oxidized

- a) MnO<sub>2</sub> is getting oxidized whereas HCl is getting reduced.
- b) MnO<sub>2</sub> and HCl both are getting reduced.
- c) MnO<sub>2</sub> and HCl both are getting oxidized.

2.4 In the above discussed reaction, what is the nature of MnO<sub>2</sub> ?

- a) Acidic oxide
- b) Basic oxide
- c) Neutral oxide
- d) Amphoteric oxide

2.5 What will happen if we take dry HCl gas instead of aqueous solution of HCl?

- a) Reaction will occur faster.
- b) Reaction will not occur.
- c) Reaction rate will be slow
- d) Reaction rate will remain the same.

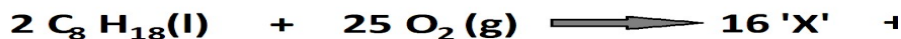
<b>Answer Key</b>	2.1(c) redox reaction 2.2(a) dry Ca(OH) <sub>2</sub> 2.3(a) MnO <sub>2</sub> is getting reduced whereas HCl is getting oxidized 2.4(b) Basic oxide 2.5(b) Reaction will not occur
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3. Read the following and answer any **four** questions from 3.1 to 3.5:

**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:



3.1 Which of the following are the products obtained from the reaction mentioned in the above case?

- |    | Product 'X'        |  | Product 'Y'                   |
|----|--------------------|--|-------------------------------|
| a) | CO <sub>2</sub>    |  | H <sub>2</sub> O <sub>2</sub> |
| b) | H <sub>2</sub> O   |  | CO                            |
| c) | CH <sub>3</sub> OH |  | H <sub>2</sub> O              |
| d) | CO <sub>2</sub>    |  | H <sub>2</sub> O              |

3.2 Identify the types of chemical reaction occurring during the combustion of fuel:

- a) Oxidation & Endothermic reaction
- b) Decomposition & Exothermic reaction
- c) Oxidation & Exothermic reaction
- d) Combination & Endothermic reaction

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

- a) Photosynthesis in plants
- b) Respiration in the human body
- c) Decomposition of vegetable matter
- d) Decomposition of ferrous sulphate.

- (a) (ii) & (iii)
- (b) (i) & (ii)
- (c) (iii) & (iv)
- (d) (ii) & (i)

3.4 '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:

- a) Limited supply of air leads to incomplete combustion of fuel.
- b) Rich supply of air leads to complete combustion of fuel.
- c) Rich supply of air leads to a combination reaction.
- d) Limited supply of air leads to complete combustion of fuel.

3.5 'Although nitrogen is the most abundant gas in the atmosphere, it does not take part in combustion'. Identify the correct reason for this statement.

- a) Nitrogen is a reactive gas
- b) Nitrogen is an inert gas
- c) Nitrogen is an explosive gas
- d) Only hydrocarbons can take part in combustion

<b>Answer Key</b>	3.1-(d) 3.2-(c) 3.3-(a) 3.4-(a) 3.5-(b)
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4. Read the following and answer any four questions from 4.1 to 4.5:

**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 ghats and households. 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.



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

- a) 10-11
- b) 5-7
- c) 2-5
- d) 7

4.2 Which of the following statements is correct for the water with detergents dissolved in it?

- a) low concentration of hydroxide ion ( $\text{OH}^-$ ) and high concentration of hydronium ion ( $\text{H}_3\text{O}^+$ )
- b) high concentration of hydroxide ion ( $\text{OH}^-$ ) and low concentration of hydronium ion ( $\text{H}_3\text{O}^+$ )
- c) high concentration of hydroxide ion ( $\text{OH}^-$ ) as well as hydronium ion ( $\text{H}_3\text{O}^+$ )
- d) equal concentration of both hydroxide ion ( $\text{OH}^-$ ) and hydronium ion ( $\text{H}_3\text{O}^+$ ).

4.3 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?

- a)  $\text{P} > \text{Q} > \text{R} > \text{S}$
- b)  $\text{P} > \text{S} > \text{Q} > \text{R}$
- c)  $\text{S} < \text{Q} < \text{R} < \text{P}$
- d)  $\text{S} < \text{P} < \text{Q} < \text{R}$

4.4 High content of phosphate ion in river Yamuna may lead to:

- a) decreased level of dissolved oxygen and increased growth of algae
- b) decreased level of dissolved oxygen and no effect of growth of algae
- c) increased level of dissolved oxygen and increased growth of algae
- d) decreased level of dissolved oxygen and decreased growth of algae

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

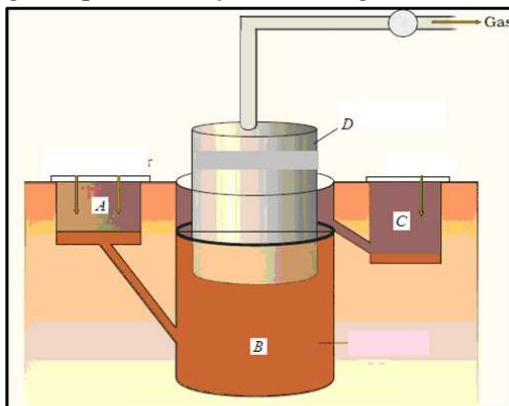
- a) Treating the water with baking soda
- b) Treating the water with vinegar
- c) Treating the water with caustic soda
- d) Treating the water with washing soda

<b>Answer Key</b>	4.1 (a) 4.2 (b) 4.3 (c) 4.4 (a) 4.5 (b)
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5. Read the following and answer any FOUR questions from 5.1 to 5.5 that follow on the basis of information provided and studied concepts.

A biogas plant is where biogas is produced by fermenting biomass.



5.1 In which of the parts would you find anaerobic bacteria ?

- a) A
- b) B
- c) C
- d) D

5.2 Which one of the following is NOT correct for biogas -

- a) its carbon neutral
- b) its non-renewable
- c) it depends on micro-organisms
- d) yields rich manure

5.3 Which of the following best indicates the steps of anaerobic digestion?

- a) Waste water feed → biogas storage → generator → biogas
- b) Waste water feed → digester → biogas → biogas storage → generator
- c) Generator → waste water feed → digester → biogas → biogas storage
- d) Waste water feed → biogas → digester → biogas storage → generator

5.4 Biogas is a better fuel than animal dung cake because

- a) Biogas is a renewable source of energy
- b) Animal dung cake has higher calorific value
- c) Biogas has high heating capacity
- d) Biogas burns without smoke.
  - i. (a) only
  - ii. (b) only
  - iii. (c) and (d)
  - iv. (a) and (b)

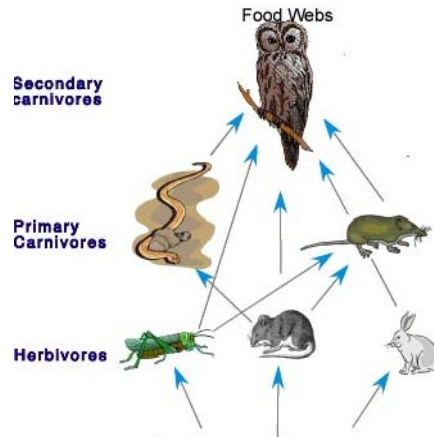
5.5 Biogas is formed in the

- a) presence of air only
- b) presence of water only
- c) presence of air and absence of water
- d) presence of water and absence of air.

Answer Key	5.1 b) B 5.2 b) its non-renewable 5.3 (b) Waste water feed → digester → biogas → biogas storage → generator 5.4 (c) (iii) and (iv) 5.5 (d) presence of water and absence of air
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6. Read the following and answer the questions any four from (i) to (v)  
Food chains are very important for the survival of most species.



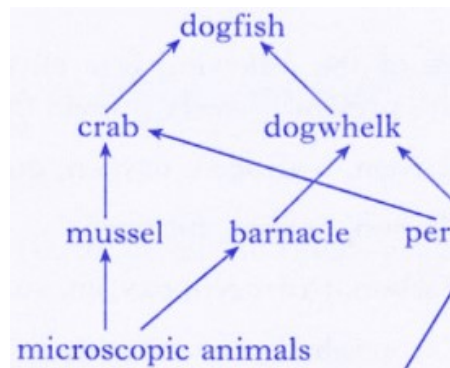
- 6.1 If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?
- 10,000 J
  - 100 J
  - 1000 J
  - It will depend on the type of the terrestrial plant.
- 6.2 If Ravi is consuming curd/yogurt for lunch , which trophic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

- 6.5 Which of the following limits the number of trophic levels in a food chain?
- Decrease in energy at higher trophic levels
  - Less availability of food
  - Polluted air
  - Water

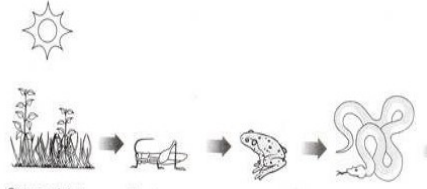
Answer Key	6.1 b) 100 J 6.2 c) Third Trophic level 6.3 a) Act at every trophic level of the food chain 6.4 c) Energy is unidirectional and matter is repeatedly circulating 6.5 a) Decrease in energy at higher trophic level
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7. Read the following and answer the questions any four from (i) to (v)  
Observe the food web and answer the questions given below -



- 7.1 The mussel can be described as
- Producer
  - Primary consumer
  - Secondary consumer
  - decomposer
- 7.2 Which trophic level is incorrectly defined?
- Carnivores – secondary or tertiary consumers
  - Decomposers – microbial heterotrophs
  - Herbivores – primary consumers
  - Omnivores – molds, yeast and mushrooms
- 7.3 The given figure best represents:

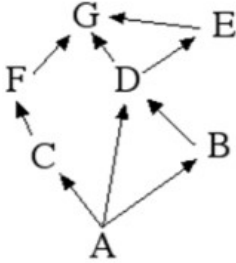


- Grassland food chain
- Parasitic food chain
- Forest food chain
- Aquatic food chain



- 7.4 Why do all food chains start with plants?  
 a) Because plants are easily grown  
 b) Because plants are nutritious  
 c) Because plants can produce its own energy  
 d) Because plants do not require energy

7.5 In the food web, what two organisms are competing for food?

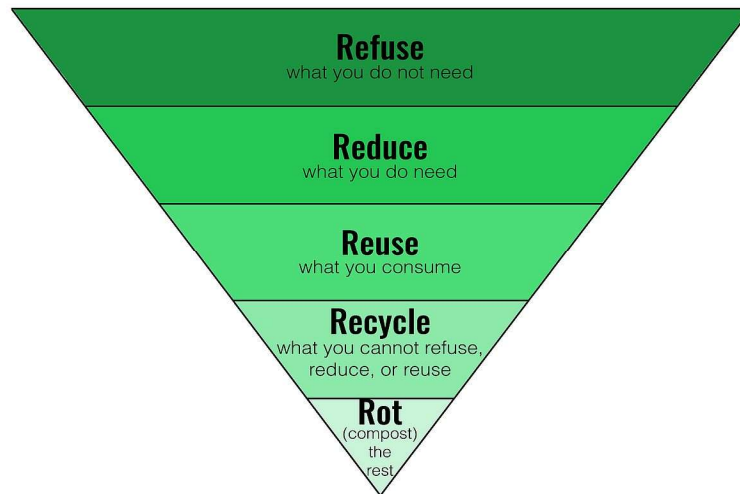


- a) A and B                      c) A and C  
 b) D and F                      d) B and D

<b>Answer Key</b>	7.1 c) Secondary consumer 7.2 d) Omnivores – molds, yeast and mushrooms 7.3 a) Grassland food chain 7.4 c) Because plants can produce its own energy 7.5 d) B and D
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8. Observe the following diagram and answer the questions **any four** from (i) to (v)



8.1 Choose the waste management strategy that is matched with correct example.

a)	Refuse	Choose products that use less packaging
b)	Reduce	Give unwanted toys and books to hospitals or schools
c)	Reuse	Not using single use plastic
d)	Repurpose	Making flower pot from used plastic bottle

8.2 Recycling of paper is a good practice but recycled paper should not be used as food packaging because

- a) recycled papers may release color /dyes on food items
- b) recycled papers are not absorbent
- c) recycled papers can cause infection due to release of methane
- d) recycled papers are costly

8.3 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

	<b>Wet waste</b>	<b>Dry waste</b>	<b>Hazardous waste</b>
a)	Cooked food, vegetable peels	Used bulbs, fluorescent lamps	Plastic carry bags, bottles, newspaper, cardboard
b)	Coffee and tea powder, garden waste	Plastic carry bags, bottles, newspaper, cardboard	Expired medicines, razors, paint cans
c)	Leftover food, vegetable peels	Coffee and tea powder, garden waste	Insect repellents, cleaning solutions
d)	Uncooked food, tea leaves	Old crockery, frying pans	Coffee and tea powder, garden waste

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

- i) less waste goes to the landfills
  - ii) better for public health and the environment
  - iii) help in reducing the waste
  - iv) resulting in deterioration of a waste picker’s health
- a) both i) and ii)
  - b) both i) and iii)
  - c) both ii) and iii)
  - d) both i) and iv)

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

- a) The cap goes into a garbage can and the bottle goes in a recycling bin
- b) Screw the cap back on the bottle, then put the bottle and cap in a recycling bin
- c) Screw the cap back on the bottle, then put the bottle and cap in the garbage can
- d) Recycle the cap separately.

Answer Key	8.1 – d 8.2 -c 8.3 -b 8.4 -a 8.5 -.a
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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.

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 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.

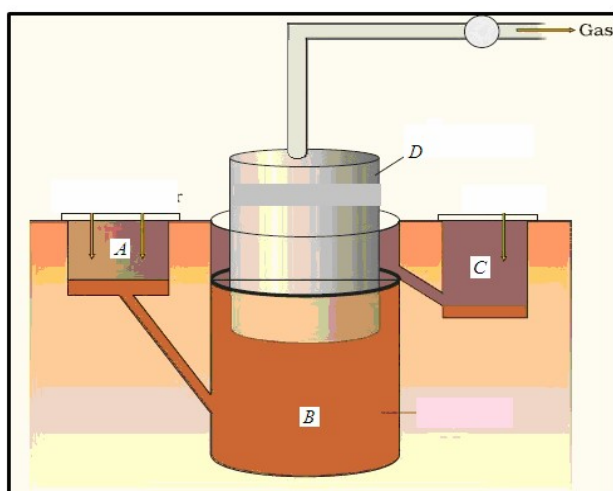
9.1 Biogas is a mixture of the following gases.

- (a) Ethane, Carbon monoxide, Nitrogen and Butane
- (b) Methane, Hydrogen, Carbon dioxide and Nitrogen
- (c) Butane, Carbon monoxide, Propane and Hydrogen
- (d) Carbon monoxide, Sulphur dioxide and Hydrogen

9.2 Raw material used in bio gas plant is

- (a) Animal dung
- (b) crop residue
- (c) Food waste
- (d) All of the above

9.3 The correct labelling in a biogas plant is given in



- |                 |            |            |             |
|-----------------|------------|------------|-------------|
| (a) A- Manure   | B- slurry  | C-Gas tank | D-Digester  |
| (b) A- Slurry   | B-Digester | C-Manure   | D- Gas tank |
| (c) A-Gas tank  | B-Manure   | C-Digester | D- Slurry   |
| (d) A- Digester | B-Gas tank | C-Slurry   | D-Manure.   |

9.4 Biogas is a better fuel than animal dung cake because

- (i) Biogas has lower calorific value.
- (ii) Animal dung cake has higher calorific value.
- (iii) Biogas has high heating capacity.
- (iv) Biogas burns without smoke.

- (a) (i) only
- (b) (ii) only
- (c) (iii) and (iv)
- (d) (i) and (ii)

9.5 Biogas is formed in the

- (a) presence of air only.
- (b) presence of water only.
- (c) absence of air only.
- (d) presence of water and absence of air.

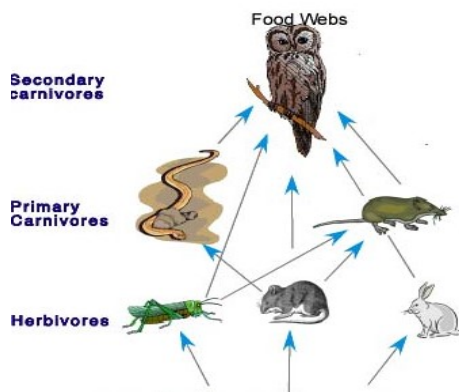
Answer Key	9.1 : (b) 9.2: (d) 9.3: (b) 9.4: (c) 9.5: (d)
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10. Read the following and answer the questions any four from (i) to (v)

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.



10.1 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?

- a) 10,000 J
- b) 100 J
- c) 1000 J
- d) It will depend on the type of the terrestrial plant.

10.2 Mr. X is eating curd/yogurt. For this food intake in a food chain he should be considered as occupying

- a) First trophic level
- b) Second trophic level
- c) Third trophic level
- d) Fourth trophic level

10.3 The decomposers are not included in the food chain.

The correct reason for the same is because decomposers:

- a) Act at every trophic level of the food chain
- b) Do not breakdown organic compounds
- c) Convert organic material to inorganic forms
- d) Release enzymes outside their body to convert organic material to inorganic forms

10.4 Matter and energy are two fundamental inputs of an ecosystem. Movement of

- a) Energy is bidirectional and matter is repeatedly circulating.
- b) Energy is repeatedly circulation and matter is unidirectional.
- c) Energy is unidirectional and matter is repeatedly circulating.
- d) Energy is multidirectional and matter is bidirectional.

10.5 Which of the following limits the number of trophic levels in a food chain?

- a) Decrease in energy at higher trophic levels
- b) Less availability of food
- c) Polluted air
- d) Water





Answer Key	10.1	b) 100 J
	10.2	c) Third Trophic level
	10.3	a) Act at every trophic level of the food chain
	10.4	c) Energy is unidirectional and matter is repeatedly circulating
	10.5	a) Decrease in energy at higher trophic level

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11. Read the following and answer the questions any four from (i) to (v)

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

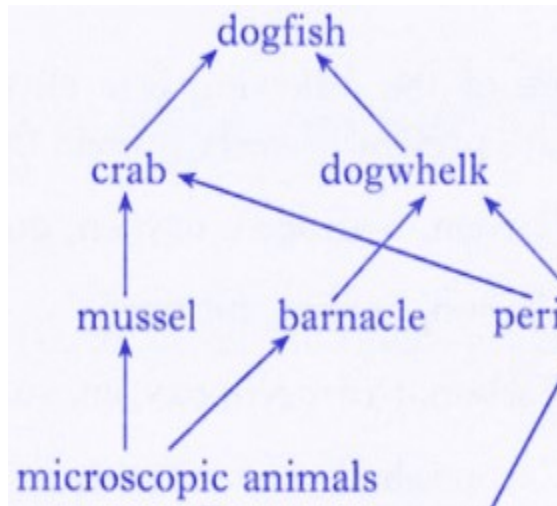
### Biotic vs. Abiotic Factors

<ul style="list-style-type: none"> <li><input type="checkbox"/> Living</li> <li><input type="checkbox"/> Examples           <ul style="list-style-type: none"> <li><input type="checkbox"/> Plants</li> <li><input type="checkbox"/> Animals</li> <li><input type="checkbox"/> Fungi</li> <li><input type="checkbox"/> Bacteria</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li><input type="checkbox"/> Non-Living</li> <li><input type="checkbox"/> Examples           <ul style="list-style-type: none"> <li><input type="checkbox"/> Water</li> <li><input type="checkbox"/> Sunlight</li> <li><input type="checkbox"/> Soil</li> <li><input type="checkbox"/> Air</li> <li><input type="checkbox"/> Temperatu</li> </ul> </li> </ul>	
			

11.1 Which trophic level is incorrectly defined?

- a) Carnivores – secondary or tertiary consumers
- b) Decomposers – microbial heterotrophs
- c) Herbivores – primary consumers
- d) Omnivores – molds, yeast and mushrooms

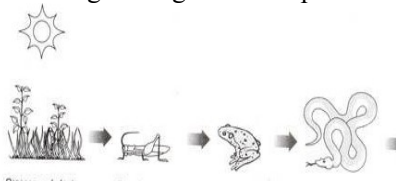
11.2 The diagram below shows a food web from the sea shore



The mussel can be described as

- a) Producer
- b) Primary consumer
- c) Secondary consumer
- d) Decomposer

11.3 The given figure best represents:



- a) Grassland food chain
- b) Parasitic food chain
- c) Forest food chain
- d) Aquatic food chain

11.4 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
- (iv) The length of the food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?

- a) (i), (iv)
- b) (i), (ii)
- c) (ii), (iii)
- d) (iii), (iv)

11.5 Which of the following group of organisms are not included in ecological food chain?

- a) Carnivores
- b) Saprophytes
- c) Herbivores
- d) Predators

Answer Key	11.1	d) Omnivores – molds, yeast and mushrooms
	11.2	c) Secondary consumer
	11.3	a) Grassland food chain
	11.4	c) (ii), (iii)
	11.5	b) Saprophytes

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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.

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.

12.1 Choose the waste management strategy that is matched with correct example.

a)	Refuse	Choose products that use less packaging
b)	Reduce	Give unwanted toys and books to hospitals or schools
c)	Reuse	Not using single use plastic
d)	Repurpose	Making flower pot from used plastic bottle

12.2 Recycling of paper is a good practice but recycled paper should not be used as food packaging because

- recycled papers take lots of space
- recycled papers can't cover food properly
- recycled papers can cause infection
- recycled papers are costly

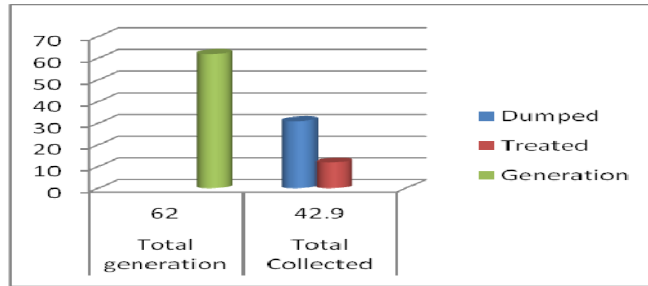
12.3 According to the 'Solid Waste Management Rule 2016', the waste should be segregated into three categories. Observe the table below and select the row that has correct information

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

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

- less waste goes to the landfills
  - better for public health and the environment
  - help in reducing the waste
  - resulting in deterioration of a waste picker's health
- both i) and ii)
  - both i) and iii)
  - both ii) and iii)
  - both i) and iv)

12.5 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.



- a) only 15% of urban India's waste is processed
- b) less than 60% of waste is collected from households
- c) more than 60% of waste is collected from households
- d) both a and b

Answer Key	12.1 (d) 12.2 (c) 12.3 (b) 12.4 (a) 12.5 (d)
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## Practice Questions 2021-22

Class X

Science (086) Theory

Term I

1. Some reactions require conditions like specific temperature, pressure, etc.

While writing chemical equations for such reactions, where are these conditions usually mentioned?

- A. above the arrow
  - B. along with products
  - C. below the plus signs
  - D. before the reactants
2. Given here is the equation of a chemical reaction.

magnesium + oxygen -----> magnesium oxide

Which of the following can be said about the equation?

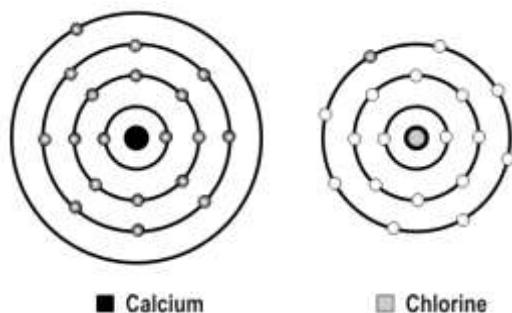
- A. Only the products are written on the left side of the equation.
  - B. Only the reactants are written on the left side of the equation.
  - C. Both the reactants and the products are written on the left side of the equation.
  - D. Both the reactants and the products are written on the right side of the equation.
3. Listed here is the reactivity of certain metals.

Metal	Reaction with air	Reaction with water	Reaction with dilute acids
Gold	Does not oxidize or burn	No reaction	No reaction
Sodium	Burns vigorously to form oxide	Violent reaction	Violent reaction
Zinc	Burns to form oxides	Reacts on heating with water	Reacts to produce hydrogen.
Platinum	Does not oxidize or burn	No reaction	No reaction

Which of the above metals are likely to be obtained in their pure states from the Earth's crust?

- A. gold only
  - B. sodium only
  - C. gold and platinum
  - D. zinc and sodium
4. Chemical equations are balanced to reflect that \_\_\_\_\_.
- A. matter can change its state during chemical reactions
  - B. matter cannot be created or destroyed during chemical reactions
  - C. heat is an important input in chemical reactions
  - D. all chemical reactions are always reversible
5. Which of the following reactions is a neutralisation reaction?

- A.  $4 \text{ Na} + \text{O}_2 \rightarrow 2 \text{ Na}_2\text{O}$   
 B.  $\text{Fe} + 2 \text{ HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$   
 C.  $\text{MgO} + \text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2$   
 D.  $\text{HNO}_3 + \text{NaOH} \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$
6. Which of the following is TRUE about a combination reaction?  
 A. The number of reactants is always greater than the number of products.  
 B. The number of products is always greater than the number of reactants.  
 C. The number of products is always equal to the number of reactants.  
 D. (Any of the above can be true for different reactions.)
7. A scientist is attempting to represent an ionic bond between calcium and chlorine. The figure below shows the progress he has made so far.



- What should be the next step in his representation of the ionic bond?
- A. Transfer an electron from the calcium atom to the chlorine atom.  
 B. Transfer an electron from the chlorine atom to the calcium atom.  
 C. Add another chlorine atom to accept an electron from the calcium atom.  
 D. Add another calcium atom to donate an electron to the chlorine atom.
8. In which of the following forms do electrovalent compounds conduct electricity?  
 A. only in solid form  
 B. both in solid form and in aqueous solution  
 C. both in aqueous solution and in molten form  
 D. in solid form, molten form and in aqueous solution
9. Sodium comes after potassium in the reactivity series, so sodium is \_\_\_\_\_.  
 A. not reactive  
 B. more reactive than potassium  
 C. equally reactive as potassium  
 D. less reactive than potassium
10. Which of the following are properties of acids?  
 P. They are bitter in taste.  
 Q. They react with metals to produce hydrogen gas.  
 R. They are easily soluble in water.  
 A. only P  
 B. only P and R  
 C. only Q and R

D. all - P, Q and R

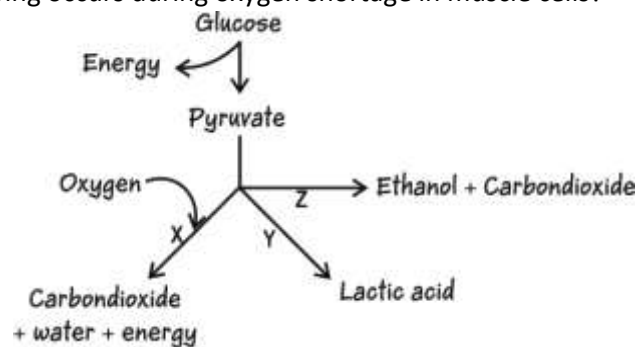
11. Organisms break down large food molecules to small molecules. How does this breakdown help the organisms?
- A. It releases a lot of energy in the digestive tract that can be used up by the cells.
  - B. It ensures that there are enough raw materials to produce and supply oxygen to the cells.
  - C. It converts the large molecules to small molecules that can pass through the cell membrane.
  - D. It makes sure that the liberation of heat by the breakdown of large molecules does not occur inside the cell.

12. The liver secretes bile, needed to digest fats in our food. The pancreas secretes several enzymes needed to break down food.

Which of the following is true of the food that we eat?

- A. It passes only through our liver.
- B. It passes only through our pancreas.
- C. It passes through both our liver and pancreas.
- D. It passes neither through our liver nor pancreas.

13. Which of the following occurs during oxygen shortage in muscle cells?



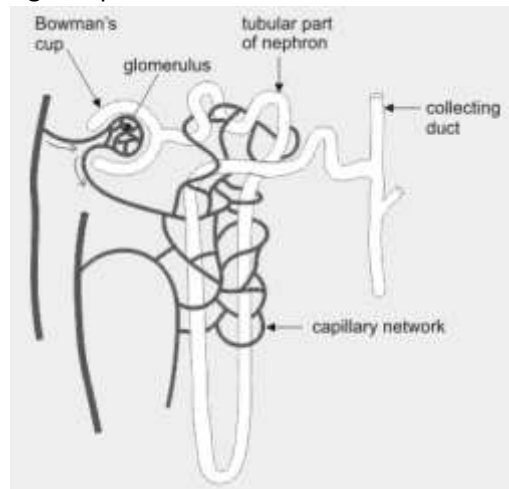
- A. only X
- B. only Y
- C. only Z
- D. any of them - X, Y or Z

14. Which of the following plays the important role of creating a suction force which pulls water upwards from the roots of a tree to its leaves?

- A. gravitation
- B. respiration

- C. transpiration
- D. photosynthesis

15. Observe the image of a single nephron.

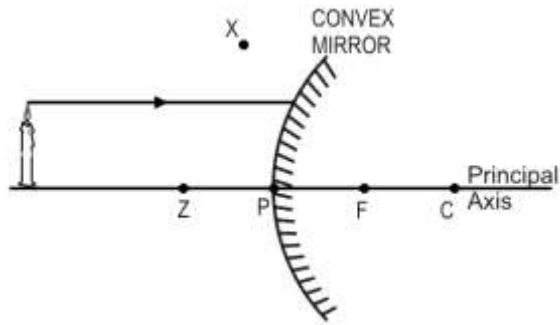


The amount of liquid passing through in the form of glomerular filtrate is approximately 150 - 180 litres per day whereas the amount of urine flowing out of all the nephrons is only 1.5 to 1.8 litres per day.

Water is getting reabsorbed.

In which part of the nephron could the water be getting reabsorbed?

- A. in the Bowman's cup
  - B. in the long tubular part
  - C. in the collecting duct
  - D. in the glomerulus
16. During transpiration, water is lost in the form of water vapour through \_\_\_\_\_.
- A. xylem
  - B. phloem
  - C. stomata
  - D. root hair
17. Which of the following characteristics of a spherical mirror is given by the ratio of the size of the image to the size of the object?
- A. aperture
  - B. magnification
  - C. focal length
  - D. radius of curvature
18. In the diagram shown below, a light ray is incident on a convex mirror.



Through which point will the ray travel after reflecting off the mirror?

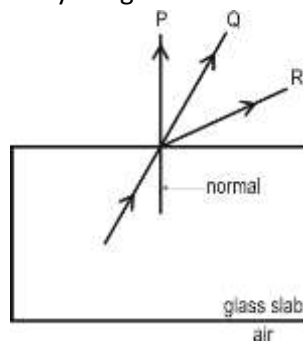
- A. C
- B. F
- C. X
- D. Z

19. As a ray of light entered medium P from medium Q, its velocity increased.

What can be said about the refractive index of medium P as compared to that of the medium Q?

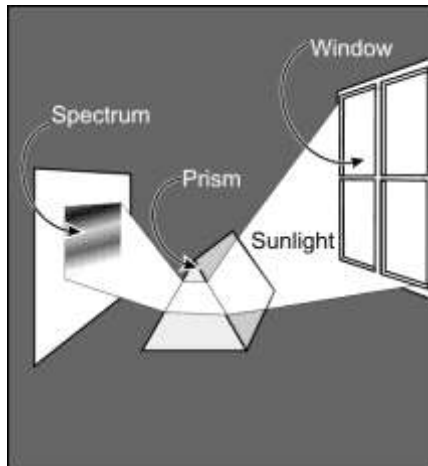
- A. It is lower.
- B. It is higher.
- C. It is the same.
- D. Nothing can be said without knowing what medium P and medium Q are.

20. In the diagram shown below, a beam of light is travelling from inside a glass slab to air. Which of the marked paths will the ray of light take as it emerges from the glass slab?



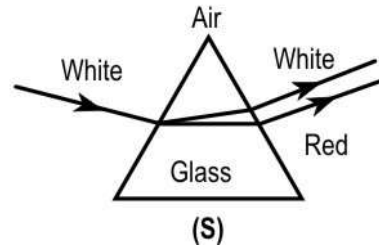
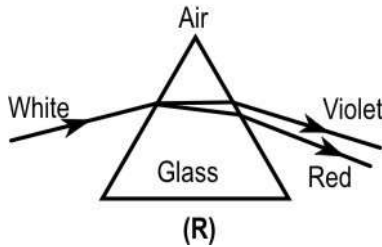
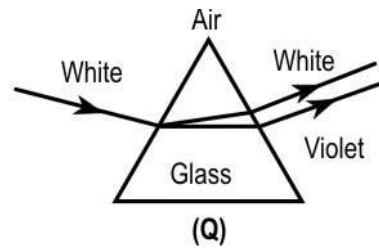
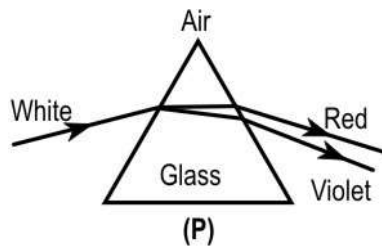
- A. P
- B. Q
- C. R
- D. None of them as light splits into its many colours.

21. The image below depicts light being split by a prism into different colours.

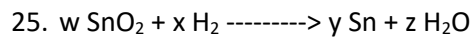


This was first observed by Isaac Newton. What would this observation help us to understand?

- A. the cause for sunspots
  - B. how X-rays are formed
  - C. the cause for rainbows
  - D. how the Sun produces light
22. An object was placed at the centre of curvature of a concave lens. The image formed by the lens would be \_\_\_\_\_.
- A. virtual, erect and same size as the object
  - B. virtual, erect and smaller than the object
  - C. real, inverted and larger than the object
  - D. real, inverted and same size as the object
23. The Sun appears red during sunset because \_\_\_\_\_.
- A. of the refraction of the sunlight by the atmosphere
  - B. the intensity of light reaching the Earth decreases in the evening
  - C. most of the blue light is scattered away by the atmospheric particles near the horizon
  - D. light is scattered to a greater extent in the evening due to a slight decrease in temperature
24. The path of light rays passing through a glass prism is BEST represented by \_\_\_\_\_.



- A. only P
- B. only R
- C. either Q or S
- D. either P or R



For which of the following values of  $w$ ,  $x$ ,  $y$  and  $z$  will the equation above be balanced?

- A.  $w=1, x=1, y=1, z=1$
- B.  $w=1, x=2, y=2, z=1$
- C.  $w=1, x=2, y=1, z=2$
- D.  $w=1, x=1, y=1, z=2$

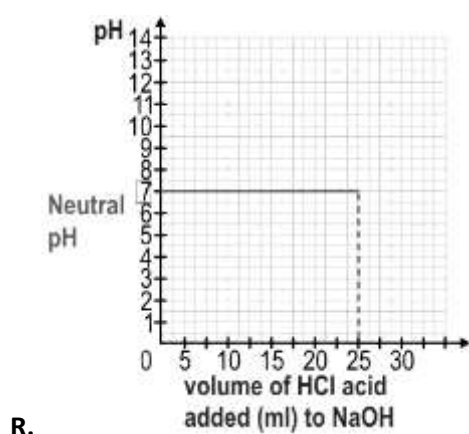
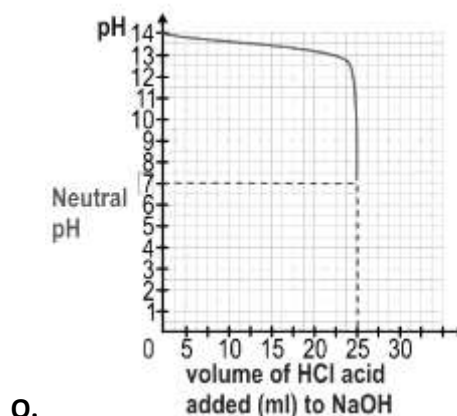
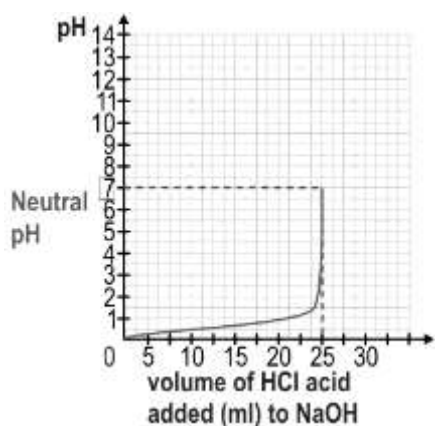
26. A solution of an acid with pH 5.1 is given. Which of the following can be done to increase its pH?

- i. add distilled water to it
- ii. add a solution of a different acid with pH 5.8
- iii. add few drops of a base with an unknown pH

- A. only i
- B. only iii
- C. only i and ii
- D. any of i, ii and iii

27. Aditi adds dropwise 25 ml of concentrated HCl to 25 ml of concentrated NaOH and continuously monitors the pH in the mixture. She finds that the pH of the mixture at the end of the experiment is 7.

Which of the following graph correctly demonstrates the change in pH in the mixture during the experiment?



- A. only P
- B. only Q
- C. either P or Q
- D. any of them - P, Q or R

28. Anand took four colourless solutions P, Q, R and S, and performed the following tests. What is the definite conclusion that Anand can reach?

	<b>Solution P</b>	<b>Solution Q</b>	<b>Solution R</b>	<b>Solution S</b>
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No change in colour	No change in colour	No change in colour	Turns pink
With red litmus	No change in colour	No change in colour	No change in colour	Turns litmus blue
With blue litmus	No change in colour	Turns litmus red	No change in colour	No change in colour

- A. Both P and S are salt solutions.



- B. Both Q and S are basic solutions.
- C. Both Q and R are salt solutions.
- D. Both P and R are neutral solutions.

29. Some activities cause the soil and water resources in that area to become acidic. Once these activities are stopped, the land has to be treated to enable plants to grow once again.

Which of the following should be added to the land to decrease the acidity permanently and allow plants to grow once again?

- A. Water which is neutral.
- B. Calcium oxide which is basic.
- C. Sodium chloride which is neutral.
- D. Dilute hydrochloric acid solution.

30. Shown below is a container that is used in the transportation of goods over long distances.



These containers are made of steel. Which property of steel is mainly used to make these containers?

- A. its ductility
- B. its malleability
- C. its metallic lustre
- D. its electrical conductivity

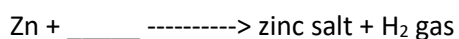
31. Payal has to arrange the following in DECREASING order of hydroxide ion concentration.

wine (pH 4.0), milk of magnesia (pH 10.5), blood (pH 7.4)

Which of the following arrangements is correct?

- A. wine -> milk of magnesia -> blood
- B. blood -> milk of magnesia -> wine
- C. milk of magnesia -> blood -> wine
- D. wine -> blood -> milk of magnesia

32. A piece of zinc (Zn) - a reactive metal - was dropped into a test tube containing a substance. A zinc salt was formed and hydrogen gas was liberated. This is shown in the equation below.

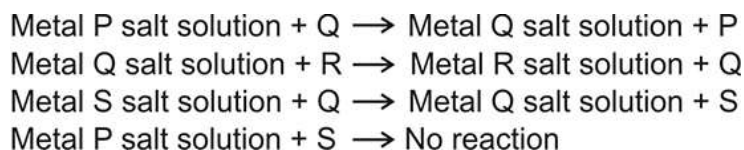


Which of the following can be the substance that zinc was dropped into?

- P) water
- Q) hydrochloric acid
- R) a solution of a zinc salt

- A. only P
- B. only Q
- C. only R
- D. either P or R

33. Given below are reactions involving metals P, Q, R and S and their salt solutions in water.



Which metal is the MOST reactive?

- A. P
- B. Q
- C. R
- D. S

34. Two statements are given - one labelled Assertion (A) and the other labelled Reason (R).

Assertion: Sodium carbonate is commonly used as an ingredient in antacid tablets.

Reason: Sodium carbonate is a basic salt.

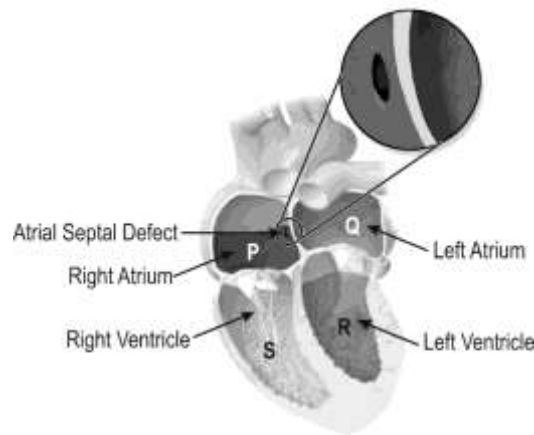
Which of the following is correct?

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

35. Some adults have a defective heart since birth. They are born with a hole between the left atrium and right atrium (shown below), this defect is called the Atrial Septal Defect (ASD).

Due to the hole between the atria, oxygenated blood gets mixed with deoxygenated blood.

A symptom of this disease is to feel tired easily.

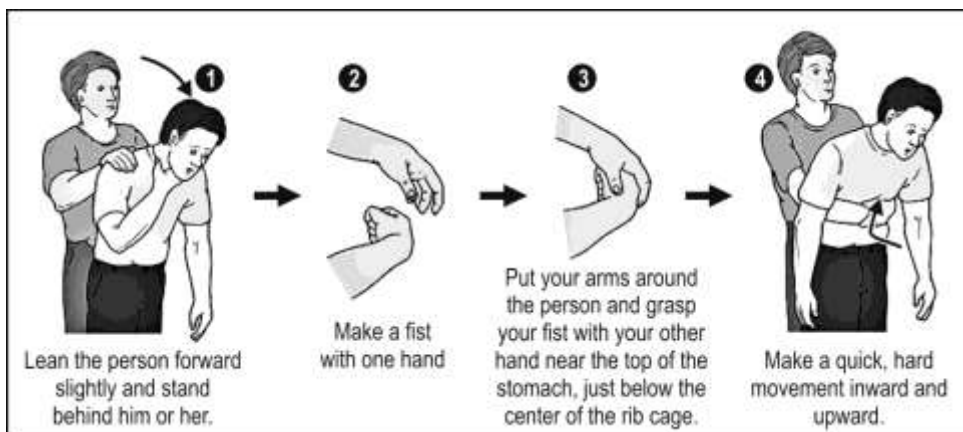


Heart with Atrial Septal Defect

Which of the following is likely to happen in people with ASD in a single cycle of blood flow?

- A. The kidneys will filter out more carbon dioxide.
- B. The blood will take up more oxygen from the lungs.
- C. The muscles will receive blood containing less oxygen.
- D. The lungs will receive blood containing more carbon dioxide.

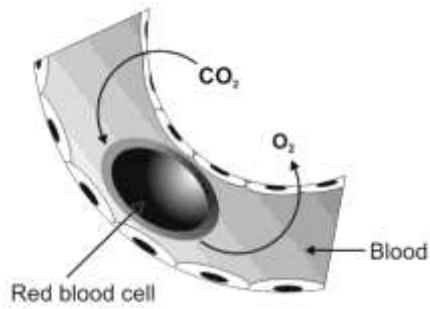
36. A person can choke when a piece of food becomes lodged in the windpipe, blocking the flow of air. A first aid procedure to remove the blockage is the Heimlich manoeuvre described below:



By performing this procedure, the piece of food is pushed out of the windpipe. Which of the following causes this to happen?

- A. the expansion of the chest
- B. the air pressed out of the lungs
- C. the food pressed out of the stomach
- D. the upward movement of the wall of the food pipe

37. Given below is a diagrammatic representation of a process taking place in the human body.

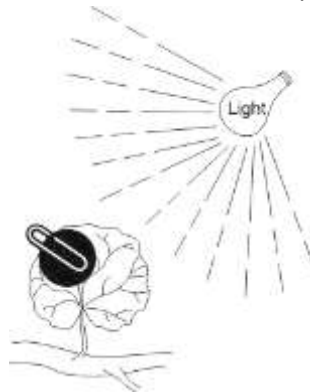


In which of these regions/organs could it be occurring?

- i. lungs
- ii. heart
- iii. brain

- A. only in i
- B. only in ii
- C. only in i and ii
- D. in all - i, ii and iii

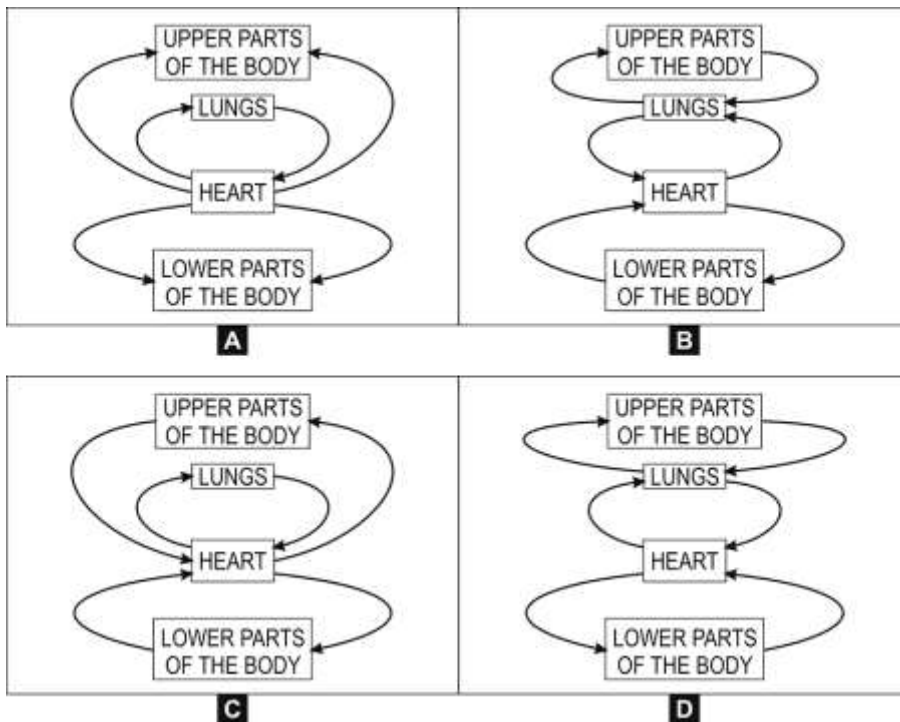
38. The diagram below shows a leaf that was covered by piece of black paper for a period of 3 days. After 3 days the paper was removed. On testing, it was found that the area under the black paper tested negative for starch and the rest tested positive for starch.



What was the experiment trying to test?

- A. if plants make their own food
- B. if light is required for plants to make food
- C. if plants can respire in the absence of light
- D. if plants can survive even in the absence of light

39. Which of these flowcharts correctly shows the circulation of blood in the human body?



40. Two statements are given - one labelled Assertion (A) and the other labelled Reason (R).

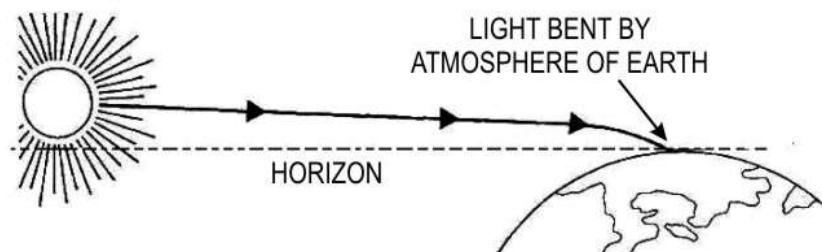
Assertion: The rate of breathing in aquatic organisms is much faster than in terrestrial organisms.

Reason: The amount of oxygen dissolved in water is much lower than the amount of oxygen in air.

Which of the following is correct?

- A. Both A and R are true, and R is the correct explanation of A.
- B. Both A and R are true, but R is not the correct explanation of A.
- C. A is true, but R is false.
- D. A is false, but R is true.

41. When light from the Sun enters the Earth's atmosphere it gets refracted. This will cause an apparent image of the Sun to appear in the sky due to refraction. The image below shows how light gets bent by the Earth's atmosphere.

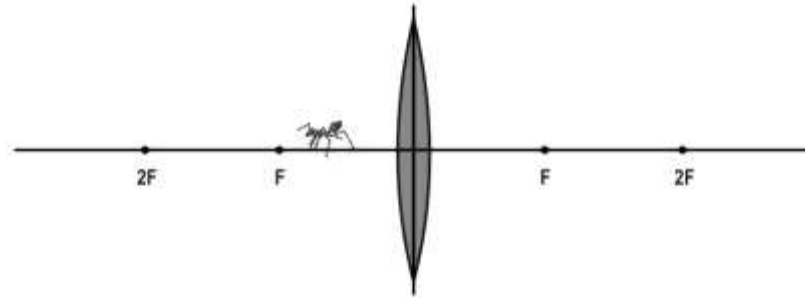


Which of the following would be an effect of this?





- A. The sky appears to be blue in colour.
- B. It is much cooler early in the morning and late in the evening.
- C. At sunrise, the Sun is seen in the sky even though it is still below the horizon.

D. The length of daylight increases during summer and decreases during winter time.

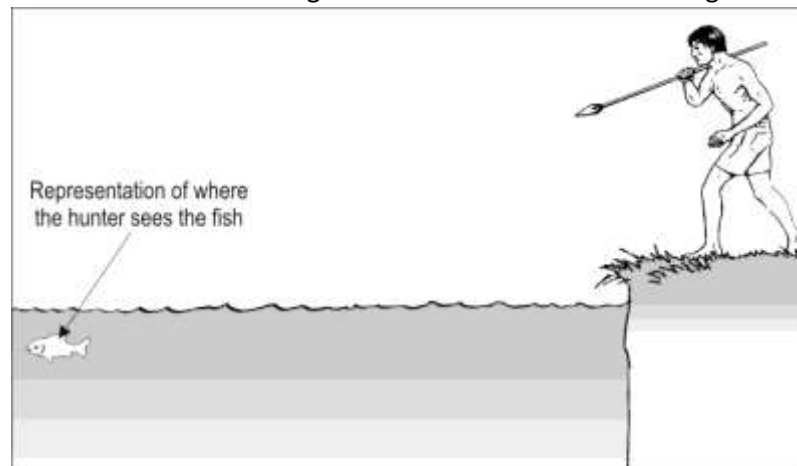
42. An ant was in front of a convex lens as shown below.



Which of the following shows the image of the ant observed through the convex lens?

- A. 
- B. 
- C. 
- D. 

43. A hunter sees a fish which is swimming in clear water as shown in the figure.



To hit the fish, he should take aim adjusting for the fish's motion and \_\_\_\_\_.

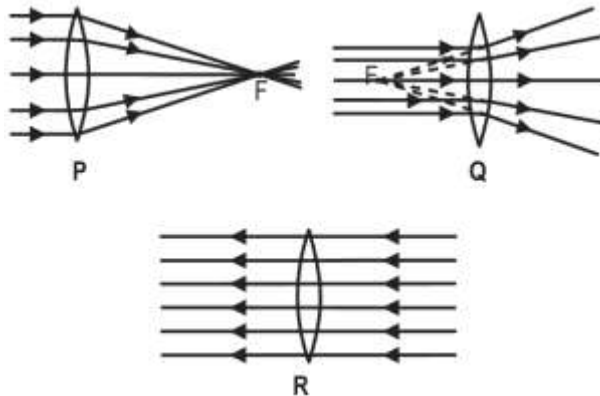
- A. exactly at the depth where the fish appears to be
- B. a little below where the fish appears to be
- C. a little above where the fish appears to be
- D. at the fish's eye, exactly where it appears to be

44. Shown below is a photograph of a convex lens.

A small, bright spot is seen on the paper when the lens is kept out facing the sun.



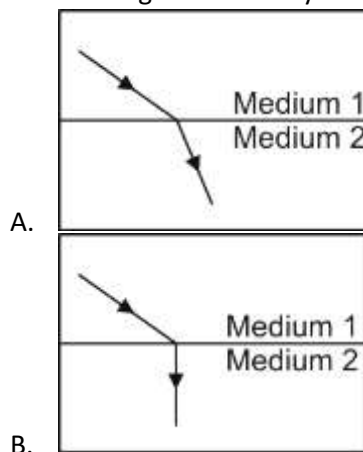
Which diagram below explains the formation of the bright spot?

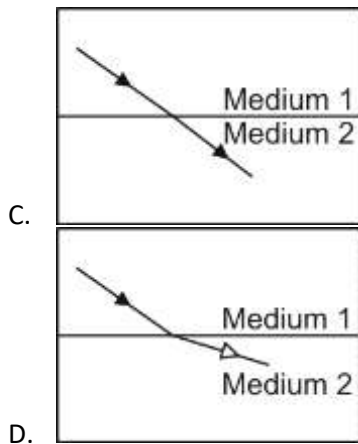


- A. only P
- B. only Q
- C. only R
- D. both P and Q

45. A ray of light passes from solid medium 1 into solid medium 2. The refractive index of medium 1 is the same as that of medium 2.

Which of the figures correctly shows the path of the ray of light in the two mediums?



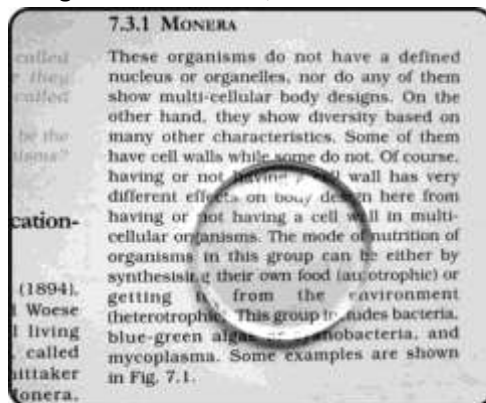


46. Two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements A and R.

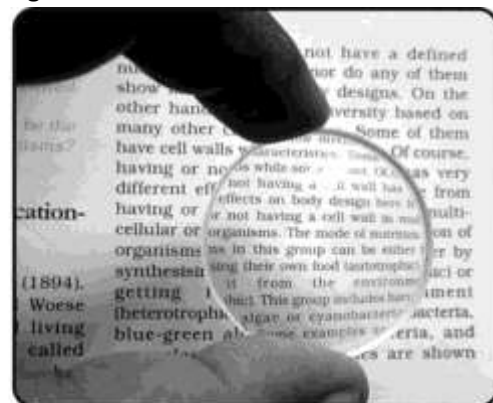
Assertion (A): Stars would not twinkle if we viewed them from the moon.

Reason (R): Stars appear to twinkle due to atmospheric refraction of starlight.

- A. Both A and R are true and R is the correct explanation for A.  
 B. Both A and R are true but R is not the correct explanation for A.  
 C. A is true but R is false.  
 D. A is false but R is true.
47. Rajan takes the following two photographs of the text in a book, first while keeping a circular piece of glass on the book, and then while holding it at some distance above the book.



Photograph 1: A piece of glass on the book



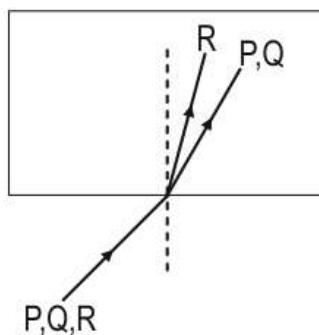
Photograph 2: A piece of glass held at some distance above the book

Which of the following statements is true about the piece of glass?

- A. It is a convex lens as the text is not inverted.  
 B. It is a concave lens as the text is diminished in size.  
 C. It is a plain glass disc as there is no difference in the text.  
 D. It cannot be predicted based on the given information.



48. A beam of light consisting of three rays - P, Q, R is incident on a transparent plastic block from air as shown in the figure below.



Which of the following statements is true?

- A. Refractive index for P is greater than that for Q.
- B. Refractive index for P is greater than that for R.
- C. Refractive index for R is greater than that for Q.
- D. Refractive index for P, Q and R is the same.

### Case

The pH values of many common liquids are given in the table below.

Substance	pH
Battery acid	< 1.0
Stomach acid	2.0
Lemon juice	2.4
Cola	2.5
Apple juice	3.5
Black Coffee	5.0
Black tea	5.5
Acid rain	5.6
Milk	6.5
Distilled water	7.0
Human saliva	7.5
Sea water	8.0
Soap	9.0 - 10.0
Milk of magnesia	10.5
Ammonia	11.5
Bleach	12.5

Study the table and answer the questions that follow.

49. Which of these is a neutralisation reaction?

- A. mixing sea water and bleach
- B. mixing lemon juice and soap

- C. mixing milk and black tea
- D. mixing cola and distilled water

50. Which of these is a valid conclusion that can be drawn from the table?

- A. Many common food items are quite acidic in nature.
- B. Our stomach contains a liquid which is a weak acid.
- C. Sea water is neither acidic nor basic - it is neutral.
- D. Acid rain, in spite of its name, is basic in nature.

51. Amit has black coffee with milk.

Which of the following is most likely to be true about the pH of the mixture?

- A. It will be less than that of black coffee.
- B. It will be more than that of distilled water.
- C. It will be more than that of acid rain.
- D. It will be less than that of apple juice.

52. Which of the following would be the best for a person suffering from acidity?

- A. cola
- B. milk
- C. black tea
- D. milk of magnesia

### Case

William Harvey (1578–1657) was one of the early biologists who studied the bodies of humans and animals. He even dissected the bodies and did experiments with the heart and blood vessels. He concluded from his experiments that the blood leaves the heart through the arteries and returns via the veins. However, he could not explain how blood left the arteries to enter the veins. He said there must be some structure between arteries and veins but he could not find them. Marcello Malpighi (1628–1694) later discovered these structures while studying a dead frog's lungs under a microscope.

53. Which of the following structures did Malpighi find in the frog?

- A. cells
- B. capillaries
- C. heart chambers
- D. small air sacs in lungs

54. What is the MOST LIKELY reason why Harvey could NOT find these structures?

- A. These structures are not found in humans.
- B. These structures are found only in the lungs.
- C. These structures become visible only in dead animals.
- D. These structures were too small to be seen by the naked eye.

55. Which of the following statements about arteries and veins is TRUE?

- A. Arteries have thicker walls than veins.
- B. Veins have thicker walls than arteries.

- C. All arteries carry only oxygenated blood.
- D. All veins carry only deoxygenated blood.

56. Which two chambers of the human heart have arteries connected to them?

- A. left atrium and left ventricle
- B. right atrium and right ventricle
- C. left atrium and right atrium
- D. left ventricle and right ventricle

### Case

Shashank went to the optician to get his eyes checked. He observed that the doctor combined two lenses and put these in front of his eyes so that he could see clearly. The powers of the two lenses used in the combination were -3 D and 4 D.

57. What type of lens will the combination of lenses be?

- A. diverging lens
- B. converging lens
- C. both converging and diverging since both types of lenses are used
- D. either converging or diverging depending on the defect in Shashank's eyes

58. Which of these will be the focal length of the combination of lenses Shashank has to wear?

- A. -14 cm
- B. +25 cm
- C. -33 cm
- D. +100 cm

59. Which of the following does the negative sign in the power -3 D signify?

- A. The focus is on the same side of the lens as the object.
- B. The focus is on the opposite side of the lens as the object.
- C. The principal focus is situated outside the principal axis.
- D. The focal length on one side of the lens is smaller than that on the other.

60. Which of the two lenses can form a real image?

- A. only the lens with power -3 D
- B. only the lens with power 4 D
- C. both the lenses
- D. neither of the lenses

### **Answer Key**

1	A	31	C
2	B	32	B
3	C	33	C
4	B	34	D
5	D	35	C

6	A	36	B
7	C	37	D
8	C	38	B
9	D	39	C
10	C	40	A
11	C	41	C
12	D	42	C
13	B	43	B
14	C	44	A
15	B	45	C
16	C	46	A
17	B	47	B
18	C	48	C
19	A	49	B
20	C	50	A
21	C	51	C
22	B	52	D
23	C	53	B
24	A	54	D
25	C	55	A
26	D	56	D
27	B	57	B
28	D	58	D
29	B	59	A
30	B	60	B