

10th Science Lesson 10 Questions in English**10] Types Of Chemical Reactions**

1. Which of the following are involved in chemical reaction?

- 1) Breaking of old chemical bonds
 - 2) Formation of a substance which has a property other than that of reactants
 - 3) Formation of new chemical bonds
- a) 1, 2
 - b) 1, 3**
 - c) 2, 3
 - d) All the above

Explanation

A **chemical reaction involves breaking of old chemical bonds and formation of new chemical bonds**. This change may happen spontaneously or it may be facilitated by external forces or energy. A chemical reaction **does not involve in formation of a substance which has a property other than that of reactants**.

2. Match the following:

- | | |
|-------------------------|----------------------------------|
| I. Human getting energy | 1. Combustion of a fuel |
| II. Plants growing | 2. Digestion of food |
| III. Moving car | 3. Oxidation of iron |
| IV. Rusting | 4. Absorbing nutrients from soil |
- a) 3, 1, 2, 4
 - b) 2, 4, 1, 3**
 - c) 2, 4, 3, 1
 - d) 2, 1, 3, 4

Explanation

Human gets energy from the digestion of the food you eat. Plants grow by absorbing nutrients from the Earth and get their food by photosynthesis. The combustion of a fuel makes the car to move. **Oxidation of iron causes rusting.**

3. Which of the following are the resultants of burning of petrol?

- 1) Water
 - 2) Carbon Monoxide
 - 3) Carbon Di-oxide
- a) 1, 3**
 - b) 1, 2

- c) 2, 3
- d) All the above

Explanation

In chemical reaction process chemical changes i.e. the materials, which undergo changes are converted into some other new materials. For example, by **burning petrol, the hydrocarbons present in it are converted into carbon dioxide and water.**

4. Which of the following happens during a chemical reaction?

- a) In a chemical reaction, the atoms of the reacting molecules or elements are rearranged to form new molecules.
- b) Old chemical bonds between atoms are broken and new chemical bonds are formed
- c) Bond breaking absorbs energy whereas bond formation releases energy
- d) **All the above**

Explanation

In a chemical reaction following changes happen:

- In a chemical reaction, the atoms of the reacting molecules or elements are rearranged to form new molecules.
- Old chemical bonds between atoms are broken and new chemical bonds are formed.
- Bond breaking absorbs energy whereas bond formation releases energy

5. In a chemical reaction compounds which undergo reactions are called as_____

- a) Products
- b) **Reactants**
- c) Catalyst
- d) None

Explanation

In the chemical equation, the chemicals of the reaction are represented by their chemical formulas. **Compounds or elements, which undergo reactions (reactants)** are shown to the left of an arrow and the compounds formed (products) are shown to the right of the arrow. The arrow indicates the direction of the reaction.

6. $A + B \rightarrow C + D$

- | | |
|--------|--------------------|
| I. A | 1. Oxygen |
| II. B | 2. Methane |
| III. C | 3. Water |
| IV. D | 4. CO ₂ |

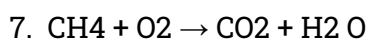
Match the following correctly:

- a) 3, 1, 2, 4
- b) **2, 1, 4, 3**
- c) 4, 1, 2, 3
- d) 4, 3, 2, 1

Explanation

When methane reacts with oxygen, it forms carbon dioxide and water. How can you represent this reaction? It can be written as a word equation as shown below:

Methane + Oxygen → Carbon dioxide + Water

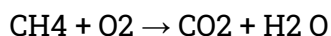


Assertion(A): This is an incomplete chemical equation

Reason(R): The law of conservation of matter states that matter cannot be created or destroyed.

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) **Both (A) and (R) are correct and (R) explains (A)**
- d) (A) is Correct and (R) is wrong

Explanation



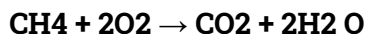
This is also an incomplete chemical equation. Because, the law of conservation of matter states that matter cannot be created or destroyed. **You cannot create new atoms by a chemical reaction. In contrast, they are rearranged in different ways by a chemical reaction to form a new compound.** So, in a chemical equation, the number of atoms of the reactants and that of the products must be equal.

8. Which of the following is the correct balanced chemical reaction?

- a) **$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$**
- b) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- c) $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- d) $2\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

Explanation

On balancing the number of atoms, the following equation can be obtained:



A balanced chemical equation is the simplified representation of a chemical reaction which describes the chemical composition, physical state of the reactants and the products, and the reaction conditions.

9. The physical state of the substances in a chemical reaction are denoted in short form within a bracket, as the _____ of the formula

- a) Super subscript
- b) Subscript**
- c) Mega subscript
- d) None

Explanation

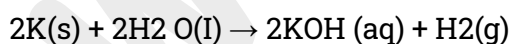
The phases or the physical state of the substances in a chemical reaction are denoted in short form within a bracket, as the **subscript of the formula**, of the respective substances.

10. Match the following substances with their state when potassium reacts with water?

- | | |
|-------------------------|---------------------|
| I. Potassium | 1. Liquid |
| II. Water | 2. Gas |
| III. Hydrogen | 3. Aqueous solution |
| IV. Potassium hydroxide | 4. Solid |
- a) 2, 1, 4, 3
 - b) 4, 1, 2, 3**
 - c) 1, 3, 2, 4
 - d) 4, 2, 1, 3

Explanation

When solid potassium reacts with liquid water, it produces hydrogen gas and potassium hydroxide solution. All the information of the reaction is given in the chemical equation as shown below:



Symbol	Phase or physical state
s	Solid
l	Liquid
g	Gas
aq	Aqueous Solution

11. _____ is a reaction in which two or more reactants combine to form a compound

- a) **Combination reaction**
- b) De-combination reaction
- c) Redox reaction
- d) None

Explanation

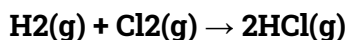
A combination reaction is a reaction in which two or more reactants combine to form a compound. It is otherwise called '**synthesis reaction**' or '**composition reaction**'.

12. Hydrogen gas combines with chlorine gas to form_____

- a) **Hydrogen chloride gas**
- b) HCl acid
- c) Aqueous solution of HCl
- d) None

Explanation

Hydrogen gas combines with chlorine gas to form hydrogen chloride gas.



13. Depending on chemical nature of the reactant, combination reaction is classified into___ types

- a) **3**
- b) 2
- c) 5
- d) 4

Explanation

Depending on the chemical nature of the reactants, there are three classes of combination reactions:

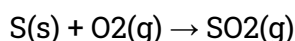
- Element + Element → Compound
- Compound + Element → Compound
- Compound + Compound → Compound

14. When Solid sulphur reacts with oxygen forms_____

- a) **Sulphur dioxide**
- b) Sulphur oxide
- c) Sulphuric oxide
- d) Hydrogen Sulphide

Explanation

When **solid sulphur reacts with oxygen, it produces sulphur dioxide**. Here both the reactants are non-metals.

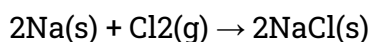


15. What is the colour of Sodium and Chlorine gas?

- a) White, green
- b) **White, Pale yellow green**
- c) Pale yellow, white
- d) White, White

Explanation

Sodium, a silvery-white metal, combines with **chlorine, a pale-yellow green gas**, to form sodium chloride, an edible compound. Here one of the reactants is a metal (sodium) and the other (chlorine) is a nonmetal.



16. Which of the following is a Compound + Element reaction?

- a) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- b) **$\text{PCl}_3 + \text{Cl}_2 \rightarrow \text{PCl}_5$**
- c) $\text{SiO}_2 + \text{CaO} \rightarrow \text{CaSiO}_3$
- d) None

Explanation

A compound reacts with an element to form a new compound. For instance, phosphorous trichloride reacts with chlorine gas and forms phosphorous pentachloride.

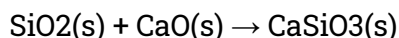


17. Most of the combination reactions are_____ in nature

- a) **Exothermic**
- b) Endothermic
- c) Redox
- d) None

Explanation

In the following reaction, silicon dioxide reacts with calcium oxide to form calcium silicate.



Most of the combination reactions are exothermic in nature. Because, they involve the formation of new bonds, which releases a huge amount of energy in the form of heat.

18. Which of the following statement about decomposition reaction is/are incorrect?

- 1) In a decomposition reaction, a single compound splits into two or more simpler substances under suitable conditions
 - 2) It is the opposite of the combination reaction
- a) 1 alone
 - b) 2 alone
 - c) 1, 2
 - d) **None**

Explanation

In a decomposition reaction, a single compound splits into two or more simpler substances under suitable conditions. It is the opposite of the combination reaction. The generalised scheme of a decomposition reaction is given below:



19. Depending on the nature of energy used in decomposition reaction it is classified into_____ types

- a) 2
- b) 5
- c) **3**
- d) 4

Explanation

Breaking of bonds is the major phenomenon in a decomposition reaction and hence it requires energy to break the bonds, depending on the nature of the energy used in the decomposition reaction. There are three main classes of decomposition reactions. They are

- Thermal Decomposition Reactions
- Electrolytic Decomposition Reactions
- Photo Decomposition Reactions

20. Which of the following is used in white washing walls?

- a) Calcium oxide
- b) Calcium carbonate
- c) **Slaked lime**
- d) None

Explanation

A solution of slaked lime is used for white washing walls. Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of calcium carbonate on the walls.

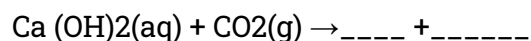
21. What is the chemical formula of marble?

- a) **CaCO₃**
- b) CaO
- c) Ca (OH)₂
- d) NaCl

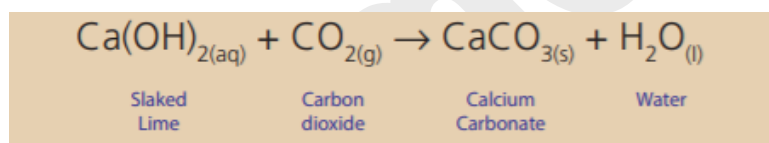
Explanation

Calcium carbonate is formed after two to three days of white washing and gives a shiny finish to the walls. **It is interesting to note that the chemical formula for marble is also CaCO₃.**

22. What is the product of the reaction?



- a) CaO, H₂O
- b) **CaCO₃, H₂O**
- c) Ca (OH)₂, H₂O
- d) CaCO₃, O₂

Explanation

23. What happens when mercury (II) oxide is heated?

- a) **Mercury metal and oxygen gas is formed**
- b) Mercury Dioxide is formed
- c) Mercury Trioxide is formed
- d) None

Explanation

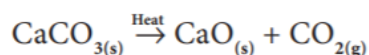
In Thermal Decomposition Reactions, the reactant is decomposed by applying heat. For example, **on heating mercury (II) oxide is decomposed into mercury metal and oxygen gas.** As the molecule is dissociated by the absorption of heat, it is otherwise called 'Thermolysis'. It is a class of compound to element/element decomposition. i.e. a compound (Hg O) is decomposed into two elements (Hg and Oxygen).

24. What happens when calcium carbonate is heated?

- a) **Calcium oxide and carbon dioxide formed**
- b) Calcium Hydroxide and carbon dioxide
- c) Calcium and water
- d) Calcium Carboxylic acid formed

Explanation

When calcium carbonate is heated, it breaks down into calcium oxide and carbon dioxide. It is a type of compound to compound/compound decomposition.



25. Thermal decomposition is_____ reaction

- a) Exothermic
- b) **Endothermic**
- c) Redox
- d) Reduction

Explanation

In thermal decomposition reaction, heat is supplied to break the bonds. Such reactions, in which heat is absorbed, are called '**Endothermic reactions**'

26. Assertion(A): Decomposition of sodium chloride occurs on passing electric current through its aqueous solution

Reason(R): In some of the decomposition reactions, electrical energy is used to bring about the Reaction

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) **Both (A) and (R) are correct and (R) explains (A)**
- d) (A) is Correct and (R) is wrong

Explanation

In some of the decomposition reactions, electrical energy is used to bring about the reaction. For example, decomposition of sodium chloride occurs on passing electric current through its aqueous solution. Sodium chloride decomposes into metallic sodium and chlorine gas. This process is termed as '**Electrolysis**'.



27. The decomposition reaction is called as_____

- a) Thermolysis
- b) Photolysis**
- c) Electrolysis
- d) Photosynthesis

Explanation

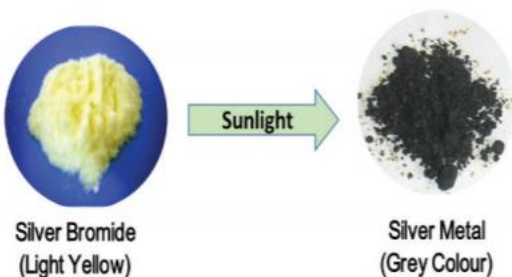
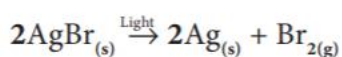
Light is another form of energy, which facilitates some of the decomposition reactions. As the decomposition is caused by the light, this kind of reaction is also called '**Photolysis**'.

28. What will be the colour of silver bromide in absence of sunlight?

- a) Grey colour
- b) Light yellow**
- c) Light green
- d) Silver brown

Explanation

The **yellow coloured silver bromide turns into grey coloured silver metal** when placed in sunlight. It is also a compound to element/element decomposition.



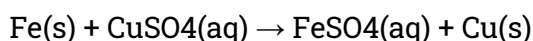
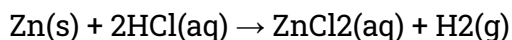
29. Which of the following is single displacement reaction?

- 1) $\text{Ca}(\text{OH})_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$
 - 2) $2\text{AgBr}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \text{Br}_2(\text{g})$
 - 3) $\text{Zn}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g})$
 - 4) $\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$
- a) 1, 2
 - b) 1, 3**

- c) 2, 3
d) 2, 4

Explanation

Single Displacement Reactions is a reaction between an element and a compound. When they react, one of the elements of the compound-reactant is replaced by the element-reactant to form a new compound and an element.



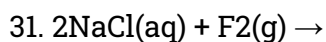
30. Arrange the most reactive elements in order:

- 1) Potassium
 - 2) Zinc
 - 3) Hydrogen
 - 4) Platinum
- a) 1, 3, 4, 2
 - b) 2, 3, 4, 1
 - c) 4, 3, 2, 1
 - d) 1, 2, 3, 4**

Explanation

To remember	Activity Series
↓	↓
• Please	Potassium (K)
• Send	Sodium (Na)
• Lions	Lithium (Li)
• Cats	Calcium (Ca)
• Monkeys	Magnesium (Mg)
• And	Aluminium (Al)
• Zebras	Zinc (Zn)
• Into	Iron (Fe)
• Lovely	Lead (Pb)
• Hot	Hydrogen (H) non-metal
• Countries	Copper (Cu)
• Signed	Silver (Ag)
• General	Gold (Au)
• Penguin	Platinum (Pt)

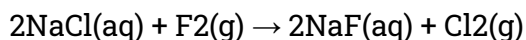

 Most reactive
 Least reactive



- a) NaF, Cl₂
- b) 2NaF, Cl₂**
- c) 2NaF, Cl₃

d) $\text{NaF}_2, 2\text{Cl}$

Explanation



$2\text{NaF}(\text{aq}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{F}_2(\text{g})$ The first reaction involves the displacement of chlorine from NaCl, by fluorine. In the second reaction, chlorine displaces fluorine from NaF. Out of these two, the second reaction will not occur. Because, fluorine is more active than chlorine and occupies the upper position in the periodic table.

32. Which of the following statement is correct?

- 1) When two compounds react, if their ions are interchanged, then the reaction is called double displacement reaction.
 - 2) The ion of one compound is replaced by the ion of another compound
 - 3) This reaction is also called 'Metathesis Reaction'
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

When two compounds react, if their ions are interchanged, then the reaction is called double displacement reaction. The ion of one compound is replaced by the ion of another compound. Ions of identical charges are only interchanged, i.e., a cation can be replaced by other cations. This reaction is also called '**Metathesis Reaction**'

33. For a double displacement reaction to take place_____

- a) Both products must be precipitate alone
- b) One of the products, must be water alone
- c) **One of the products must be a precipitate or water**
- d) None

Explanation

For a double displacement reaction to take place, one of the products must be a precipitate or water. By this way, there are major classes of double displacement reactions. They are:

- Precipitation Reactions
- Neutralization Reactions

34. Which of the following statement about decomposition reaction is correct?

- 1) A single reactant is decomposed to form one or more products

- 2) Energy is released
- 3) Single compound is the reactant
 - a) 1, 2
 - b) 1, 3**
 - c) 2, 3
 - d) All the above

Explanation

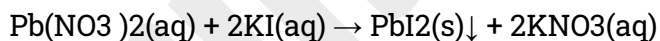
COMBINATION REACTIONS	DECOMPOSITION REACTIONS
One or more reactants combine to form a single product	A single reactant is decomposed to form one or more products
Energy is released	Energy is absorbed
Elements or compounds may be the reactants	Single compound is the reactant

35. What is the colour of lead (II) iodide?

- a) Blue
- b) Yellow**
- c) Red
- d) Green

Explanation

When the clear aqueous solutions of potassium iodide and lead (II) nitrate are mixed, a double displacement reaction takes place between them.



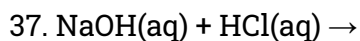
Potassium and lead displace or replace one other and form a yellow precipitate of lead (II) iodide

36. The product of Neutralization Reaction is always_____

- a) Acid
- b) Base
- c) Salt**
- d) None

Explanation

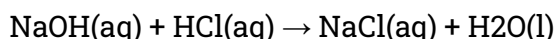
In your lower classes, you have learned the reaction between an acid and a base. **It is another type of displacement reaction in which the acid reacts with the base to form a salt and water.** It is called 'neutralization reaction' as both acid and base neutralize each other.



- a) NaH_2, OH
- b) **$\text{NaCl}, \text{H}_2\text{O}$**
- c) $\text{HCl}, \text{Na}(\text{OH})_2$
- d) HOCl, Na

Explanation

Reaction of sodium hydroxide with hydrochloric acid is a typical neutralization reaction. Here, **sodium replaces hydrogen from hydrochloric acid forming sodium chloride, a neutral soluble salt.**



38. Which of the following statement is correct?

- 1) A combustion reaction is one in which the reactant rapidly combines with oxygen to form one or more oxides and energy
 - 2) Combustion reactions are majorly used as heat energy sources in many of our day to day activities.
- a) 1 alone
 - b) 2 alone
 - c) **1, 2**
 - d) None

Explanation

A combustion reaction is one in which the **reactant rapidly combines with oxygen to form one or more oxides and energy (heat).** So, in combustion reactions one of the reactants must be oxygen. Combustion reactions are majorly used as heat energy sources in many of our day to day activities. For instance, we use LPG gas for domestic cooking purposes.

39. Which of the following are the mixture of LPG?

- 1) Propane
 - 2) Butane
 - 3) Propylene
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) **All the above**

Explanation

LPG is a mixture of hydrocarbon gases like propane, butane, propylene, etc. All these hydrocarbons burn with oxygen to form carbon dioxide and water.

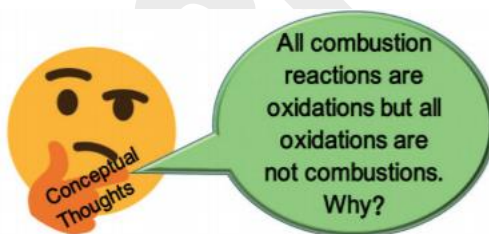


40. Which of the following statement is correct?

- 1) All combustion reactions are oxidation reaction
 - 2) All oxidation reactions are not combustion
 - 3) Combustion reaction is an exothermic reaction
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) **All the above**

Explanation

Since heat is evolved, it is an exothermic reaction. As oxygen is added, it is also an oxidation. So, combustion may be called as an exothermic oxidation.



41. Which of the following is a combustion?

- 1) Digestion of Food
 - 2) Rusting of iron
 - 3) Evaporation of water
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) **None**

Explanation

(i) Digestion of Food

(ii) Rusting of iron

None of the reaction is combustion reaction, because digestion food is endothermic reaction and rusting of iron does not produce energy.

42. Assertion(A): Liquid water freezes into ice, it is a permanent change

Reason(R): Physical changes can be reversed easily.

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) Both (A) and (R) are correct and (R) explains (A)
- d) (A) is wrong and (R) is correct

Explanation

You know that innumerable changes occur every day around us. For example, liquid water freezes into ice, but then ice melts into liquid water. In other words, freezing is reversed. So, it is not a permanent change. Moreover, it is a physical change. **Physical changes can be reversed easily.**

43. Which of the following statement is correct?

- 1) The carbon compounds present in the wood are burnt into carbon dioxide gas and water.
 - 2) Some chemical reactions can be reversed
 - 3) On recharging the mobile, these chemical reactions are reversed.
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Let us consider the burning of a wood. **The carbon compounds present in the wood are burnt into carbon dioxide gas and water.** Can we get back the wood immediately from carbon dioxide and water? We cannot. So, it is a permanent change. In most of the cases, we cannot. But, some chemical reactions can be reversed. Our mobile phone gets energy from its lithium-ion battery by chemical reactions. It is called discharging. **On recharging the mobile, these chemical reactions are reversed. Thus, chemical reactions may be reversed under suitable conditions. Hence, they are grouped into two categories such as reversible and irreversible reactions.**

44. Which of the following statement about reversible reaction is correct?

- 1) It is a reaction that can be reversed
 - 2) A reversible reaction is represented by a double arrow with their heads in the direction opposite to each other
 - 3) The products can be converted back to the reactants
- a) 1, 2
 - b) 1, 3
 - c) 2, 3

d) All the above

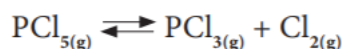
Explanation

A reversible reaction is a reaction that can be reversed, i.e., the products can be converted back to the reactants. A reversible reaction is represented by a double arrow with their heads in the direction opposite to each other.

45. Which of the following statement about forward reaction is the decomposition of PCl_5 and the backward reaction is the combination of PCl_3 and Cl_2 is correct?

- 1) Initially, the forward reaction proceeds faster than the backward reaction
 - 2) After sometimes, the speed of both the reactions become equal.
 - 3) PCl_5 cannot be completely converted into the products as the reaction is reversed
- a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation



The forward reaction is the decomposition of PCl_5 and the backward reaction is the combination of PCl_3 and Cl_2 . Initially, the forward reaction proceeds faster than the backward reaction. After sometimes, the speed of both the reactions become equal. So, PCl_5 cannot be completely converted into the products as the reaction is reversed. It is a reversible reaction. The actual measurements of the given reaction show that the reaction is at equilibrium, but the amount of PCl_5 is more than that of PCl_3 and Cl_2 .

46. If hydrogen peroxide is poured on a wound, it decomposes into_____

- a) Water and oxygen
- b) Hydrogen and oxygen
- c) Hydrochloric acid
- d) Hydrogen and water

Explanation

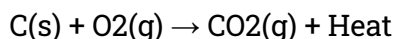
If hydrogen peroxide is poured on a wound, it decomposes into water and oxygen. The gaseous oxygen bubbles away as it is formed and thus prevent the formation of H_2O_2 . Thus, more amount of product can be obtained in a reversible reaction by the periodical removal of one of the products or the periodical addition of the reactants.

47. Which of the following statement about irreversible reaction is correct?

- 1) The reaction that cannot be reversed is called irreversible reaction.
- 2) The combustion of coal into carbon dioxide and water is an example of irreversible reaction
- 3) Backward reaction is not possible in this case
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

The reaction that cannot be reversed is called irreversible reaction. The irreversible reactions are unidirectional, i.e., they take place only in the forward direction. Consider the combustion of coal into carbon dioxide and water.



In this reaction, solid coal burns with oxygen and gets converted into carbon dioxide gas and water. As the product is a gas, as soon as it is formed it escapes out of the reaction container. It is extremely hard to decompose a gas into a solid. Thus, the backward reaction is not possible in this case. So, it is an irreversible reaction.

48. Which of the following statement about reversible reaction is correct?

- 1) It can be reversed under suitable conditions.
- 2) It is fast.
- 3) It attains equilibrium.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

REVERSIBLE REACTION	IRREVERSIBLE REACTION
It can be reversed under suitable conditions.	It cannot be reversed.
Both forward and backward reactions take place simultaneously.	It is unidirectional. It proceeds only in forward direction.
It attains equilibrium.	Equilibrium is not attained.
The reactants cannot be converted completely into products.	The reactants can be completely converted into products.
It is relatively slow.	It is fast.

49.

The rate of this reaction is given by

$$\text{Rate} = -\frac{d[A]}{dt} = +\frac{d[B]}{dt}$$

What does the negative sign indicate?

- a) Increase in product
- b) **Decrease in reactant**
- c) Decrease in both product and reactant
- d) None

Explanation

The rate of this reaction is given by

$$\text{Rate} = -\frac{d[A]}{dt} = +\frac{d[B]}{dt}$$

Where, [A] – Concentration of A [B] – Concentration of B

The negative sign indicates the decrease in the concentration of A with time. The positive sign indicates the increase in the concentration of B with time.

50. Which of the following statement is correct?

- 1) Faster the reaction, more will be the amount of the product in a specified time.

- 2) Rate of reaction is also important for a food processor who hopes to slow down the reactions that cause food to spoil.
- 1 alone
 - 2 alone
 - 1, 2
 - None

Explanation

Faster the reaction, more will be the amount of the product in a specified time. So, the rate of a reaction is important for a chemist for designing a process to get a good yield of a product. **Rate of reaction is also important for a food processor who hopes to slow down the reactions that cause food to spoil.**

51. Iron gets rusted faster in_____

- Acid
- Bases
- Water
- None

Explanation

The rate of a reaction can be changed. For example, **iron gets rusted faster in an acid than in water.** Some factors influence the rate of a reaction.

52. Which of the following are the factors that affect rate of a reaction?

- Catalyst
 - Pressure
 - Nature of the reactants
 - Temperature
- 1, 2, 3
 - 2, 3, 4
 - 1, 3, 4
 - All the above

Explanation

Important factors that affect rate of a reaction are

- Nature of the reactants
- Concentration of the reactants
- Temperature
- Catalyst
- Pressure

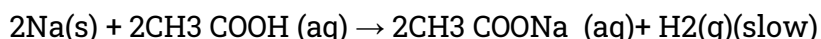
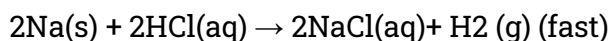
- Surface area of the reactants

53. Which of the following reacts faster with sodium?

- a) HCl
- b) Acetic acid
- c) Formic acid
- d) None

Explanation

The reaction of sodium with hydrochloric acid is faster than that with acetic acid. Hydrochloric acid is a stronger acid than acetic acid and thus more reactive. So, the nature of the reactant influence the reaction rate.



54. Assertion(A): Changing the amount of the reactants also increases the reaction rate

Reason(R): More the concentration, more particles per volume exist in it and hence faster the reaction.

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) **Both (A) and (R) are correct and (R) explains (A)**
- d) (A) is wrong and (R) is correct

Explanation

Changing the amount of the reactants also increases the reaction rate. The amount of the substance present in a certain volume of the solution is called 'concentration'. More the concentration, more particles per volume exist in it and hence faster the reaction. Granulated zinc reacts faster with 2M hydrochloric acid than 1M hydrochloric acid.

55. Assertion(A): Calcium carbonate reacts slowly with hydrochloric acid at room temperature. When heated reaction will be faster.

Reason(R): Most of the reactions go faster at higher temperature.

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong

c) Both (A) and (R) are correct and (R) explains (A)

d) (A) is wrong and (R) is correct

Explanation

Most of the reactions go faster at higher temperature. Because adding heat to the reactants provides energy to break more bonds and thus speed up the reaction. **Calcium carbonate reacts slowly with hydrochloric acid at room temperature.** When the reaction mixture is heated the reaction-rate increases.

56. Assertion(A): Food kept at room temperature spoils faster than that kept in the refrigerator

Reason(R): Most of the reactions go faster at higher temperature.

a) Both (A) and (R) are correct, but (R) does not explain (A)

b) Both (A) and (R) are wrong

c) Both (A) and (R) are correct and (R) explains (A)

d) (A) is wrong and (R) is correct

Explanation

Food kept at room temperature spoils faster than that kept in the refrigerator. In the refrigerator, the temperature is lower than the room temperature and hence the reaction rate is less.

57. If the reactants are gases, increasing their pressure_____ the reaction rate.

a) Increases

b) Decreases

c) Initially increase then decreases

d) None

Explanation

If the reactants are gases, increasing their pressure increases the reaction rate. This is because, on increasing the pressure the reacting particles come closer and collide frequently.

58. On heating potassium chlorate, it decomposes into_____

a) KCl, O₂

b) KOH, Cl₂

c) KClO₂

d) KOH, H₂

Explanation

A catalyst is a substance which increases the reaction rate without being consumed in the reaction. In certain reactions, adding a substance as catalyst speeds up the reaction. For example, **on heating potassium chlorate, it decomposes into potassium chloride and oxygen gas, but at a slower rate.** If manganese dioxide is added, it increases the reaction rate.

59. Which of the following statement is correct?

- 1) When solid reactants are involved in a reaction, their powdered form reacts more readily
- 2) Because, powdering of the reactants increases the surface area and more energy is available on collision of the reactant particles
 - a) 1 alone
 - b) 2 alone
 - c) 1, 2
 - d) None

Explanation

When solid reactants are involved in a reaction, their powdered form reacts more readily. For example, powdered calcium carbonate reacts more readily with hydrochloric acid than marble chips. Because, powdering of the reactants increases the surface area and more energy is available on collision of the reactant particles. Thus, the reaction rate is increased.

60. Which of the following statement is correct?

- 1) In a reversible reaction, both forward and backward reactions take place simultaneously
- 2) When the rate of the forward reaction becomes equal to the rate of backward reaction, then no more product is formed.
- 3) This stage of the reaction is called 'equilibrium state'.
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

In a reversible reaction, both forward and backward reactions take place simultaneously. When the rate of the forward reaction becomes equal to the rate of backward reaction, then no more product is formed. This stage of the reaction is called 'equilibrium state'. After this stage, no net change in the reaction can occur and hence in the amount of the reactants and products. Since this equilibrium is attained in a chemical reaction, it is called 'Chemical Equilibrium'

Rate of forward reaction = Rate of backward reaction

61. Assertion(A): Initially the rate of the backward reaction is greater than the rate of the forward

Reaction

Reason(R): During the course of reaction, the concentration of the reactants decreases and the concentration of the products increases.

- a) Both (A) and (R) are correct, but (R) does not explain (A)
- b) Both (A) and (R) are wrong
- c) Both (A) and (R) are correct and (R) explains (A)
- d) (A) is wrong and (R) is correct

Explanation

Initially the rate of the forward reaction is greater than the rate of the backward reaction. However, during the course of reaction, the concentration of the reactants decreases and the concentration of the products increases. Since the rate of a reaction is directly proportional to the concentration, the rate of the forward reaction decreases with time, whereas the rate of the backward reaction increases.

62. Which of the following statement is correct?

- 1) Not only chemical changes, physical changes also may attain equilibrium.
 - 2) Physical equilibrium is a state of a physical change at which the volume of all the phases remain unchanged.
- a) 1 alone
 - b) 2 alone
 - c) 1, 2
 - d) None

Explanation

Not only chemical changes, physical changes also may attain equilibrium. When water kept in a closed vessel evaporates, it forms water vapour. No water vapour escapes out of the container as the process takes place in a closed vessel. So, it builds up the vapour pressure in the container. At one time, the water vapour condenses back into liquid water and when the rate of this condensation becomes equal to that of vapourisation, the process attains equilibrium. At this stage, the volume of the liquid and gaseous phases remain constant. Since it is a physical change, the equilibrium attained is called 'Physical Equilibrium'. **Physical equilibrium is a state of a physical change at which the volume of all the phases remain unchanged.**

63. Which of the following properties remain unchanged in a equilibrium reaction?

- 1) Colour
- 2) Viscosity

- 3) Density
- 4) Pressure
 - a) 1, 2, 4
 - b) 2, 3, 4
 - c) 1, 3, 4
 - d) All the above

Explanation

Characteristics of equilibrium:

- In a chemical equilibrium, the rates of the forward and backward reactions are equal.
- **The observable properties such as pressure, concentration, colour, density, viscosity etc., of the system remain unchanged with time.**
- The chemical equilibrium is a dynamic equilibrium, because both the forward and backward reactions continue to occur even though it appears static externally.
- In physical equilibrium, the volume of all the phases remain constant.

64. In Aerated soft drinks dissolved carbon dioxide in the form of_____

- a) Carbonic acid
- b) Carboxylic acid
- c) Epoxy resin
- d) Hydrogen chloride

Explanation

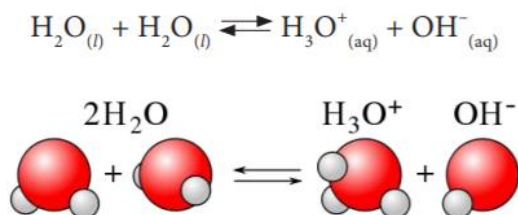
Aerated soft drinks contain dissolved carbon dioxide in a pop bottle (Soda). **When the bottle is sealed, the dissolved carbon dioxide (in the form of carbonic acid) and gaseous CO₂ are in equilibrium with each other.** When you open the bottle, the gaseous CO₂ can escape. So, the dissolved CO₂ begins to un-dissolve back to the gas phase trying to replace the gas that was lost, when you opened the bottle. That's why if you leave it open long enough, it will go 'flat'. All the CO₂ will be gone, blown away in the air.

65. Which of the following statement is correct?

- 1) Although pure water is often considered as a non-conductor of electricity, precise measurements show that it conducts electricity to a little extent
- 2) This conductivity of water has resulted from the self-ionisation of water
- 3) The proton gets dissolved in water forming the hydronium ion
 - a) 1, 2
 - b) 1, 3
 - c) 2, 3
 - d) All the above

Explanation

Although pure water is often considered as a non-conductor of electricity, precise measurements show that it conducts electricity to a little extent. This conductivity of water has resulted from the self-ionisation of water. Self-ionisation or auto ionisation is a reaction in which two like molecules react to give ions. In the process of ionisation of water, a proton from one water molecule is transferred to another water molecule leaving behind an OH^- ion. The proton gets dissolved in water forming the hydronium ion as shown in the following equation:



66. The hydronium ion formed is a_____ acid and the hydroxyl ion is a_____ base

- a) Strong, Weak
- b) Weak, Weak
- c) **Strong, Strong**
- d) Weak, Strong

Explanation

The hydronium ion formed is a strong acid and the hydroxyl ion is a strong base. So as fast as they are formed, they react again to produce water. Thus, it is a reversible reaction and attains equilibrium very quickly. So, the extent of ionisation is very little and the concentration of the ions produced is also very less.

67. What is the value of ionic product of water?

- a) **1.00×10^{-14}**
- b) 1.00×10^{14}
- c) 2.00×10^{-14}
- d) 2.00×10^{14}

Explanation

The product of the concentration of the hydronium ion and the hydroxyl ion is called 'ionic product of water'. It is denoted as ' K_w '. It is mathematically expressed as follows:

$$K_w = [\text{H}_3\text{O}^+] [\text{OH}^-]$$

Its unit is $\text{mol}^2 \text{dm}^{-6}$. At 25°C , its value is 1.00×10^{-14} .

68. Which of the following decides whether the aqueous solution is acid or base?

- a) Hydrogen ion
- b) Hydroxyl ions
- c) **Either a or b**
- d) None

Explanation

All the aqueous solutions may contain **hydrogen and hydroxyl ions** due to self-ionisation of water. In addition to this ionisation, substances dissolved in water also may produce hydrogen ions or hydroxyl ions. **The concentration of these ions decides whether the solution is acidic or basic.**

69. pH scale is a scale for measuring the_____ ion concentration in a solution

- a) **Hydrogen**
- b) Hydroxyl
- c) Chlorine
- d) None

Explanation

pH scale is a scale for measuring the hydrogen ion concentration in a solution. The 'p' in pH stands for 'Potenz' in German meaning 'power'. pH notation was devised by the Danish biochemist Sorensen in 1909.

70. Match the following

- | | |
|-------------------------|----------------------|
| I. Acids | 1. pH equal to 7 |
| II. Bases | 2. pH greater than 7 |
| III. A neutral solution | 3. pH less than 7 |
| a) 2, 1, 3 | |
| b) 2, 3, 1 | |
| c) 3, 2, 1 | |
| d) 1, 2, 3 | |

Explanation

pH scale is a set of numbers from 0 to 14 which is used to indicate whether a solution is acidic, basic or neutral.

- Acids have pH less than 7
- Bases have pH greater than 7
- A neutral solution has pH equal to 7

The pH is the negative logarithm of the hydrogen ion concentration.

i.e. $\text{pH} = -\log_{10}[\text{H}^+]$

71. Match the following acids with their pH level:

- | | | |
|------|--------------|--------|
| I. | HCl (4%) | 1. 4.2 |
| II. | Vinegar | 2. 0 |
| III. | Human saliva | 3. 3 |
| IV. | Tomato juice | 4. 6-8 |
- a) 2, 1, 3, 4
b) **2, 3, 4, 1**
c) 2, 4, 1, 3
d) 1, 3, 4, 2

Explanation

COMMON ACIDS	pH
HCl (4%)	0
Stomach acid	1
Lemon juice	2
Vinegar	3
Oranges	3.5
Soda, grapes	4
Sour milk	4.5
Fresh milk	5
Human saliva	6-8
Pure water	7
Tomato juice	4.2

72. Match the following with their pH level:

- | | | |
|------|------------------|--------|
| I. | Blood plasma | 1. 5.6 |
| II. | Drain cleaner | 2. 10 |
| III. | Milk of magnesia | 3. 13 |
| IV. | Coffee | 4. 7.4 |
- a) 4, 1, 2, 3
b) **4, 3, 2, 1**
c) 2, 3, 1, 4
d) 3, 1, 2, 4

Explanation

COMMON BASES	pH
Blood plasma	7.4
Egg white	8
Sea water	8
Baking soda	9
Antacids	10
Ammonia water	11
Lime water	12
Drain cleaner	13
Caustic soda 4% (NaOH)	14
Milk of mag- nesia	10
Coffee	5.6

73. Which of the following statement is correct?

- 1) The pH of a solution can be determined by using a universal indicator.
 - 2) It comes in the form of a solution or a pH paper
 - 3) The colour of the solution on the pH paper is compared with the colour chart and the pH value is read from it. The pH values thus obtained are only approximate values.
- a) 1, 2
 - b) 2, 3
 - c) 1, 3
 - d) All the above

Explanation

The pH of a solution can be determined by using a universal indicator. It contains a mixture of dyes. It comes in the form of a solution or a pH paper. A more common method of measuring pH in a school laboratory is by using the pH paper. A pH paper contains a mixture of indicators. It shows a specific colour at a given pH. A colour guide is provided with the bottle of the indicator or the strips of paper impregnated with it, which are called pH paper strips. The test solution is tested with a drop of the universal indicator, or a drop of the test solution is put on the pH paper. **The colour of the solution on the pH paper is compared with the colour chart and the pH value is read from it.** The pH values thus obtained are only approximate values.

74. Match the following

- | | |
|---------------------------------------|---------------|
| I. Our body works within the pH range | 1] 7.4 |
| II. pH of blood is ranges b/w | 2] 7.0 to 7.8 |

- III. Ideal pH for blood 3] 7.35 to 7.45
- a) 2, 1, 3
 - b) 2, 3, 1**
 - c) 3, 1, 2
 - d) 1, 3, 2

Explanation

Our body works within the pH range of 7.0 to 7.8. Living organisms can survive only in a narrow range of pH change. Different body fluids have different pH values. For example, **pH of blood is ranging from 7.35 to 7.45.** Any increase or decrease in this value leads to diseases. The **ideal pH for blood is 7.4.**

75. Which acid is produced by stomach?

- a) Formic acid
- b) HCl**
- c) H₂SO₄
- d) HOCl

Explanation

It is very interesting to note that **our stomach produces hydrochloric acid.** It helps in the digestion of food without harming the stomach.

76. What is the pH of stomach fluid?

- a) 2.0**
- b) 4.2
- c) 3.9
- d) 1.0

Explanation

During indigestion the stomach produces too much acid and this causes pain and irritation. **pH of the stomach fluid is approximately 2.0.**

77. Which of the following statement is correct?

- 1) pH of the saliva normally ranges between 6.5 to 7.5.
 - 2) White enamel coating of our teeth is calcium carbonate, the hardest substance in our body
 - 3) When the pH of the mouth saliva falls below 5.5, the enamel gets weathered
- a) 1, 2
 - b) 2, 3
 - c) 1, 3**
 - d) All the above

Explanation

pH of the saliva normally ranges between 6.5 to 7.5. White enamel coating of our teeth is **calcium phosphate**, the hardest substance in our body. When the pH of the **mouth saliva falls below 5.5, the enamel gets weathered.** Toothpastes, which are generally basic are used for cleaning the teeth that can neutralise the excess acid and prevent tooth decay.

78. Citrus fruits require slightly_____ soil

- a) Acidic
- b) Basic
- c) **Alkaline**
- d) Saline

Explanation

In agriculture, the pH of the soil is very important. **Citrus fruits require slightly alkaline soil, while rice requires acidic soil and sugarcane requires neutral soil.**

79. The pH of rain water is approximately_____

- a) **7**
- b) 9
- c) 4
- d) 3

Explanation

The pH of rain water is approximately 7, which means that it is neutral and also represents its high purity. If the atmospheric air is polluted with oxide gases of sulphur and nitrogen, they get dissolved in the rain water and make its pH less than 7. Thus, if the pH of rain water is less than 7, then it is called acid rain. When acid rain flows into the rivers it lowers the pH of the river water also.

80. Calculate the pH of 0.01 M HNO_3 ?

- a) **2**
- b) 4
- c) 1
- d) 5

Explanation

$$[H^+] = 0.01$$

$$pH = -\log_{10} [H^+]$$

$$pH = -\log_{10} [0.01]$$

$$pH = -\log_{10} [1 \times 10^{-2}]$$

$$pH = -(\log_{10} 1 - 2 \log_{10} 10)$$

$$pH = 0 + 2 \times \log_{10} 10$$

$$pH = 0 + 2 \times 1 = 2$$

$$pH = 2$$

81. The hydroxyl ion concentration of a solution is 1×10^{-9} M. What is the pOH of the solution?

- a) 10
- b) 11
- c) 9
- d) 2

Explanation

Example: The hydroxyl ion concentration of a solution is 1×10^{-9} M. What is the pOH of the solution?

Solution

$$pOH = -\log_{10} [OH^-]$$

$$pOH = -\log_{10} [1 \times 10^{-9}]$$

$$pOH = -(\log_{10} 1.0 + \log_{10} 10^{-9})$$

$$pOH = -(0 - 9 \log_{10} 10)$$

$$pOH = -(0 - 9)$$

$$pOH = 9$$

82. Which of the following is correct?

- a) **$pH + pOH = 14$**
- b) $pH + pOH = -14$
- c) $pH - pOH = 14$
- d) $pH \times pOH = 14$

Explanation

The pH and pOH of a water solution at 25 degree C, are related by the following equation.

$$pH + pOH = 14$$

If either the pH or the pOH of a solution is known, the other value can be calculated.

83. A solution has a pOH of 11.76. What is the pH of this solution?

- a) 2.24
- b) 3.9
- c) 3.7
- d) 4.9

Explanation

Example: A solution has a pOH of 11.76.

What is the pH of this solution?

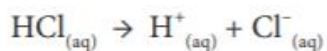
$$\begin{aligned}\text{pH} &= 14 - \text{pOH} \\ \text{pH} &= 14 - 11.76 = 2.24\end{aligned}$$

84. Calculate the pH of 0.001 molar solution of HCl

- a) 8
- b) 3
- c) 1
- d) 9

Explanation

Solution: HCl is a strong acid and is completely dissociated in its solutions according to the process:



From this process it is clear that one mole of HCl would give one mole of H^{+} ions. Therefore, the concentration of H^{+} ions would be equal to that of HCl, i.e., 0.001 molar or $1.0 \times 10^{-3} \text{ mol litre}^{-1}$.

Thus, $[\text{H}^{+}] = 1 \times 10^{-3} \text{ mol litre}^{-1}$

$$\begin{aligned}\text{pH} &= -\log_{10}[\text{H}^{+}] = -\log_{10} 10^{-3} \\ &= -(-3 \times \log_{10}) = -(3 \times 1) = 3\end{aligned}$$

Thus, $\text{pH} = 3$

85. What would be the pH of an aqueous solution of sulphuric acid which is $5 \times 10^{-5} \text{ mol litre}^{-1}$ in Concentration?

- a) 1

- b) 8
- c) 4
- d) 2

Explanation

Solution: Sulphuric acid dissociates in water as:



Each mole of sulphuric acid gives two mole of H^+ ions in the solution. One litre of H_2SO_4 solution contains 5×10^{-5} moles of H_2SO_4 which would give $2 \times 5 \times 10^{-5} = 10 \times 10^{-5}$ or 1.0×10^{-4} moles of H^+ ion in one litre of the solution.

Therefore,

$$[\text{H}^+] = 1.0 \times 10^{-4} \text{ mol litre}^{-1}$$

$$\begin{aligned} \text{pH} &= -\log_{10} [\text{H}^+] = -\log_{10} 10^{-4} = -(-4 \times \log_{10} 10) \\ &= -(-4 \times 1) = 4 \end{aligned}$$

86. If the pH of a solution is 4.5, what is its pOH?

- a) 8.5
- b) 7.5
- c) 4.5
- d) 9.5

Explanation

Example 5: If the pH of a solution is 4.5, what is its pOH?

Solution:

$$\text{pH} + \text{pOH} = 14$$

$$\text{pOH} = 14 - 4.5 = 9.5$$

$$\text{pOH} = 9.5$$

87. Calculate the pH of a solution in which the concentration of the hydrogen ions is 1.0×10^{-8} mol Litre⁻¹.

- a) 3
- b) 9
- c) 1
- d) 8

Explanation

Solution: Here, although the solution is extremely dilute, the concentration given is not of an acid or a base but that of H^+ ions. Hence, the pH can be calculated from the relation:

$$pH = -\log_{10}[H^+]$$

$$\text{given } [H^+] = 1.0 \times 10^{-8} \text{ mol litre}^{-1}$$

$$\begin{aligned} pH &= -\log_{10} 10^{-8} = -(-8 \times \log_{10} 10) \\ &= -(-8 \times 1) = 8 \end{aligned}$$