



Selina Concise Chemistry Class 9 ICSE Solutions Chemical Changes and Reactions

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Question 1.

(a) What is a chemical reaction?

(b) State the conditions necessary for a chemical change or reaction.

Solution:

1. A chemical reaction is the process of breaking the chemical bonds of the reacting substances (reactants) and making new bonds to form new substances (products).
2. Conditions necessary for a chemical change or reaction are
  - Evolution of gas
  - Change of colour
  - Formation of precipitate
  - Change of state

Question 2.

Define the following terms

a. Chemical bond

b. Effervescence

c. Precipitate

Solution:

- A chemical bond is the force which holds the atoms of a molecule together as in a compound.
- Formation of gas bubbles in a liquid during a reaction is called effervescence.
- Chemical reactions which are characterised by the formation of insoluble solid substances are called precipitates.

Question 3.

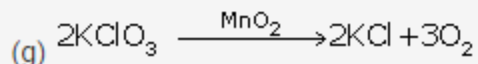
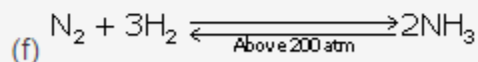
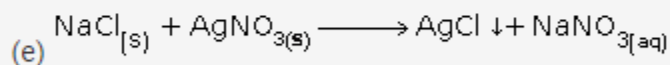
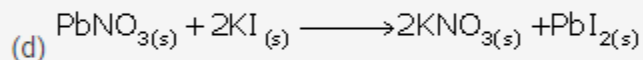
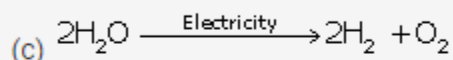
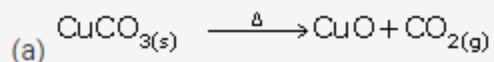
Give an example of a reaction where the following are involved

(a) Heat



- (b) Light
- (c) Electricity
- (d) Close contact
- (e) Solution
- (f) Pressure
- (g) Catalyst

Solution:



Question 4.

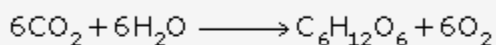
Define

- (a) Photochemical reaction
- (b) Electrochemical reaction

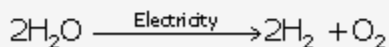
Give an example in each case.

Solution:

(a) It is a reaction which occurs with absorption of light energy. |



(b) It is a reaction which occurs with absorption of electrical energy.





Question 5.

Give an example of each of the following chemical changes:

A photochemical reaction involving

(i) silver salt (ii) water

A reaction involving

(i) blue solution

(ii) formation of dirty green precipitate

Two gases combine to form white solid

Two solids combine to form a liquid

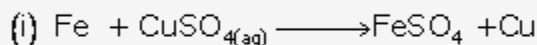
A reaction where colour change is noticed

Solution:

(a)

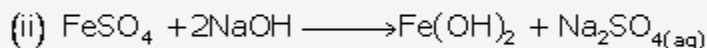


(b)

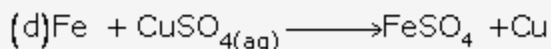
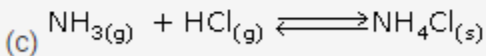


Blue solution

Green solution



Dirty green ppt.



Blue solution

Green solution

Question 6.

Write the chemical reaction where the following changes are observed.

(a) Gas is evolved

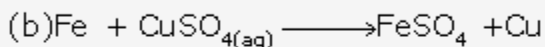
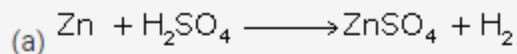
(b) Colour change is noticed

(c) Precipitate is formed

(d) Physical state is changed

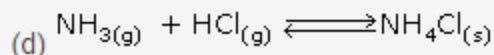
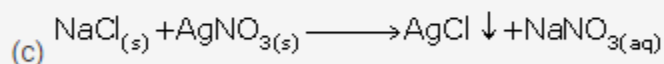


Solution:



Bluesolution

Greensolution



Question 7.

Give reason for the following:

Silver nitrate solution is kept in coloured bottles.

Molybdenum is used in the manufacture of ammonia.

Blue solution of copper sulphate changes to green when a piece of iron is added to this solution.

Colourless concentrated sulphuric acid in a test tube changes to blue on adding a small piece of copper to it.

Solution:

- Silver nitrate solution is kept in brown bottles in the laboratory because it decomposes in the presence of light.
- Molybdenum increases the efficiency of the catalyst iron used in the manufacture of ammonia.
- This is because the blue colour of the copper sulphate solution fades and eventually turns into light green due to the formation of ferrous sulphate.

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Question 1

Complete the following statements:

The chemical change involving iron and hydrochloric acid illustrates a \_\_\_\_\_ reaction.

In the type of reaction called \_\_\_\_\_, two compounds exchange their positive and negative radicals.

A catalyst either \_\_\_\_\_ or \_\_\_\_\_ the rate of a chemical change but itself remains \_\_\_\_\_ at the end of the reaction.

On heating, hydrated copper sulphate changes its colour from \_\_\_\_\_ to \_\_\_\_\_.

Solution:



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- Displacement
- Double decomposition
- Accelerate, decelerate, unaffected
- Blue, white

### Question 2.

When hydrogen burns in oxygen, water is formed; when electricity is passed through water, hydrogen and oxygen are given out. Name the type of chemical change involved in the two cases.

Solution:

Combination

Decomposition

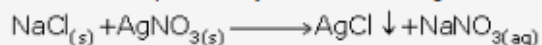
### Question 3.

Explain, giving one example for each of the following chemical changes:

- Double decomposition
- Thermal decomposition
- Reversible reaction
- Displacement

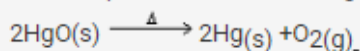
Solution:

(a) Double decomposition: This is a type of chemical change in which two compounds in a solution react to form two new compounds by mutual exchange of radicals.



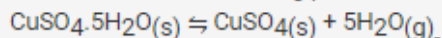
(b) Thermal decomposition

A decomposition reaction brought about by heat is known as thermal decomposition.



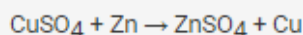
(c) Reversible reaction

A chemical reaction in which the direction of a chemical change can be reversed by changing the conditions under which the reaction is taking place is called a reversible reaction.



(d) Displacement

It is a chemical change in which a more active element displaces a less active element from its salt solution.



### Question 4.

(a) What is synthesis?

(b) What kind of chemical reaction is synthesis? Support your answer by an example.

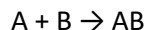
Solution:



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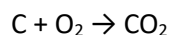
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A reaction in which two or more substances combine together to form a single substance is called a synthesis or combination reaction.



In the above reaction, substances A and B combine to give a molecule of a new substance, AB.

Carbon burns in oxygen to form a gaseous compound, carbon dioxide.

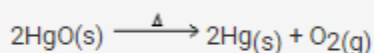


Question 5.

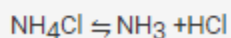
Decomposition brought about by heat is known as thermal decomposition. What is the difference between thermal dissociation and thermal decomposition?

Solution:

A decomposition reaction brought about by heat is known as thermal decomposition.



A simultaneous reversible decomposition reaction brought about only by heat is thermal dissociation.



Question 6.

Define neutralization reaction with an example.

Give balanced equation for this reaction.

Give three applications of neutralization reactions.

Solution:

The reaction between an acid and a base which forms salt and water only is referred to as reaction of neutralisation.

Applications of neutralisation reactions:

- When someone is stung by a bee, formic acid enters the skin and causes pain, which can be relieved by rubbing the spot with slaked lime or baking soda, both of which are bases.
- Acid which accidentally spills on to our clothes can be neutralised with ammonia solution.
- If the soil is somewhat acidic and thus unfavourable for growing of certain crops, then slaked lime is added to neutralise the excess acid.

Solution 7:

Hydrolysis is the process in which a salt and water react to form an acidic or basic solution.

In the process of hydrolysis, only those salts hydrolyse which are formed by the reaction of

- strong base and weak acid
- strong acid and weak base

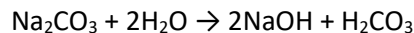
This happens because a salt formed due to a strong base and a weak acid on dissolving in water will form a basic solution.

A basic solution turns red litmus blue.

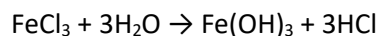


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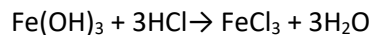


However, the salt formed due to a strong acid and a weak base on dissolving in water will make an acidic solution. Acidic solutions turn blue litmus red.

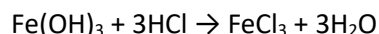


Solution 8:

Iron(III) chloride is a salt prepared from strong acid HCl and a weak base  $\text{Fe}(\text{OH})_3$ .



On the other hand, sodium carbonate is a salt prepared from a strong base NaOH and a weak acid  $\text{H}_2\text{CO}_3$ .



Question 9

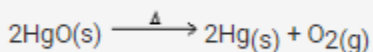
- (a) What is decomposition?  
(b) Support your answer by an example.

Solution:

Decomposition is the breaking up of a compound either into elements or simpler compounds such that these products do not combine to form the original compound.

Decomposition may occur in the presence of heat or light or by the passage of an electric current.

Example: Mercuric oxide when heated decomposes to form two elements-mercury and oxygen.



Question 10.

State the type of reactions each of the following represent and balance the ones that are not balanced.

- (a)  $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$   
(b)  $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$   
(c)  $2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$   
(d)  $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$   
(e)  $\text{PbO}_2 + \text{SO}_2 \rightarrow \text{PbSO}_4$   
(f)  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$   
(g)  $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$   
(h)  $\text{KNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{HNO}_3 + \text{KHSO}_4$   
(i)  $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$   
(j)  $\text{CaCO}_2 \rightarrow \text{CaO} + \text{CO}_2$   
(k)  $\text{NH}_4\text{Cl} \rightarrow \text{NH}_3 + \text{HCl}$   
(l)  $\text{PbO} + 2\text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$   
(m)  $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

Solution:

- $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$   
Displacement



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- $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$   
Displacement
- $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$   
Decomposition
- $\text{PbO}_2 + \text{SO}_2 \rightarrow \text{PbSO}_4$   
Combination
- $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$   
Double decomposition
- $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$   
Decomposition
- $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$   
Decomposition
- $\text{KNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{HNO}_3 + \text{KHSO}_4$   
Double decomposition
- $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$   
Displacement
- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$   
Decomposition
- $\text{NH}_4\text{Cl} \rightarrow \text{NH}_3 + \text{HCl}$   
Decomposition

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Question 1.

Explain the main characteristics reactions





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Solution:

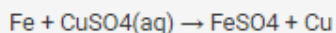
Main characteristics of chemical reactions are

(i) Evolution of gas: In many chemical reactions, one of the products is a gas.



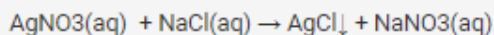
(ii) Change of colour:

Certain chemical reactions are characterised by a change in the colour of the reactants.



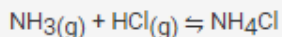
(iii) Formation of precipitates:

Certain chemical reactions are characterised by the formation of insoluble solid substances called precipitates.



(iv) Change of state:

In many chemical reactions, a change of state is observed. The reaction might start with gaseous or liquid reactants and end with solid products and *vice versa*.



Question 2.

Define exothermic and endothermic changes. Give two examples in each case.



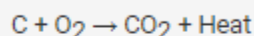
Solution:

### Exothermic reaction:

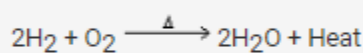
A chemical reaction in which heat is given out is called an exothermic reaction.

Example:

When carbon burns in oxygen to form carbon dioxide, a lot of heat is produced.



When hydrogen is burnt in oxygen, water is formed and heat is released.

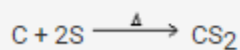


### Endothermic reaction:

A reaction in which heat is absorbed is called endothermic reaction.

Example:

When carbon is heated with sulphur at high temperature, liquid carbon disulphide is formed.



When nitrogen and oxygen are heated together to a temperature of about 3000°C, nitric oxide gas is formed.



Question 3.

State the effects of endothermic and exothermic reactions on the surroundings.

Solution:

Exothermic reactions are spontaneous and warm their surroundings with the release of heat energy.

Endothermic reactions absorb heat energy from their surroundings and cause their surroundings to cool down.

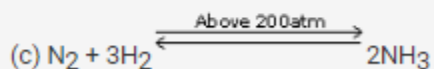
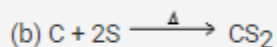
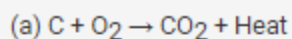
Question 4.

Give an example of a reaction where the following are involved

- (a) Evolution of heat
- (b) Absorption of heat
- (c) High pressure is required



Solution:



Question 5.

Define:

(a) Photochemical reaction

(b) Electrochemical reaction

Give one example in each case.

Solution:

(a) It is a reaction which occurs with absorption of light energy.

Example: Photosynthesis



(b) It is a reaction which occurs with absorption of electrical energy.

Example:

Acidulated water breaks into hydrogen and oxygen.



Question 6.

Give an example of each of the following chemical changes.

(a) A reaction involving

(i) Change of state

(ii) formation of precipitate

(b) An exothermic and an endothermic reaction involving carbon as one of the reactants.

(c) A reaction where colour change is noticed.

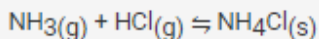


Solution:

(a)

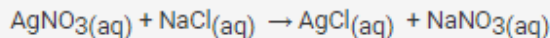
(i) Change of state

Ammonia gas reacts with HCl gas to give solid ammonium chloride.



(ii) Formation of precipitate

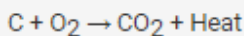
When a solution of silver nitrate is added to a solution of sodium chloride, a white insoluble substance, silver chloride, is formed.



(b)

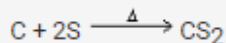
Exothermic reaction:

When carbon burns in oxygen to form carbon dioxide, a lot of heat is produced.



Endothermic reaction:

When carbon is heated with sulphur at high temperature, liquid carbon disulphide is formed.



(c) Colour change

A few pieces of iron are added into a blue coloured copper sulphate solution; the blue colour of copper sulphate fades and eventually turns into light green due to the formation of ferrous sulphate.



Question 7.

What do you understand by 'chemical reaction'?

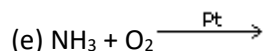
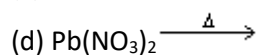
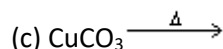
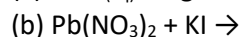
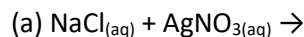
Solution:

A chemical reaction is the process of breaking the chemical bonds of the reacting substances (reactants) and making new bonds to form new substances (products).

A chemical change or chemical reaction occurs when particles collide. Collisions occur when reactants are in close contact or by supply of energy.

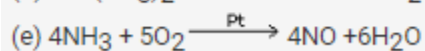
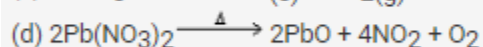
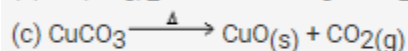
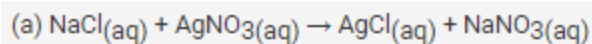
Question 8.

Complete and balance the following reactions:





Solution:



Question 9.

What do you observe? When

1. Lead nitrate is heated.
2. Silver chloride is exposed to sunlight.
3. Hydrogen peroxide is exposed to sunlight.
4. H<sub>2</sub>S gas is passed through copper sulphate solution.
5. Barium chloride is added to sodium sulphate solution
6. Water is added to the quick lime.
7. Sodium chloride solution is added to silver nitrate solution.

Solution:

- Lead nitrate decomposes on heating leaving a yellow residue lead monoxide, brown gas nitrogen dioxide and colourless gas oxygen.
- If chlorine water is exposed to sunlight, oxygen is evolved.
- Hydrogen peroxide breaks down to form water and oxygen gas along with heat energy.
- When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution.
- A white insoluble precipitate of barium sulphate is formed.

Question 10.

- (a) a carbonate which do not decompose on heating.
- (b) a nitrate which produces oxygen as the only gas.
- (c) a compound which produces carbon dioxide on heating
- (d) a nitrate which produces brown gas on heating.

Solution:

- Sodium carbonate



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- Sodium nitrate
- Zinc carbonate
- Lead nitrate