



CHAPTER 4 TYPES OF CHEMICAL REACTIONS

SOLUTIONS

Text Book Page no.70

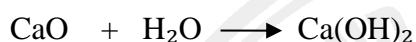
Let us answer these:

- (1) A solution of an oxide “X” is used for white washing.
(a) What could be “X”? Write its formula.
(b) Write the reaction of substance “X” named in (a) above with water.

Ans:

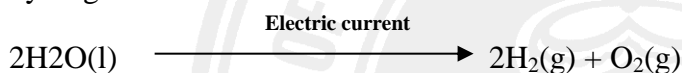
(a) The substance ‘X’ is calcium oxide. Its formula is CaO.

(b) CaO reacts with water to form calcium hydroxide, Ca(OH)₂.



- (2) Why is the amount of gas collected in one of the test tubes in activity 4.5 double of the amount collected in the other? Name this gas.

Ans: The gas which is collected in double of the amount in the electrolysis of water is hydrogen.

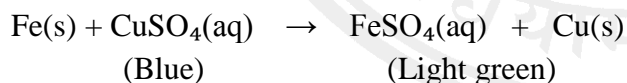


This is because in water, H₂O the two constituent elements, hydrogen and oxygen are always combined in the fixed ratio of 2:1 by volume that is it contains two parts of hydrogen element as compared to one part of oxygen element.

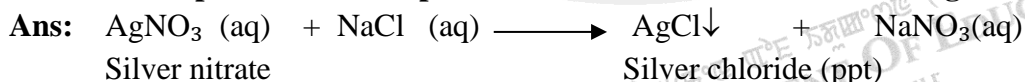
Let us answer these: Page 80

- a) Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

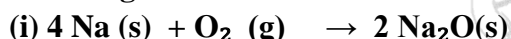
Ans: The blue colour of copper sulphate discharges and changes to light green colouration when an iron nail is dipped in it. This is due to the displacement of copper from copper sulphate CuSO₄ solution by iron thereby forming ferrous sulphate, FeSO₄



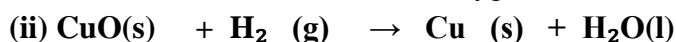
- b) Give an example of double displacement reaction other than the one given in activity 4.8.



- c) Identify the substances that are oxidised and the substances that are reduced in the following reaction.



Ans: Sodium, Na is oxidised and oxygen, O₂ is reduced.

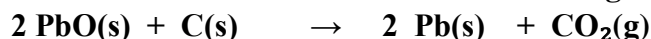


Ans: H₂ is oxidised to H₂O and CuO is reduced to Cu.



Exercises: Page 82

1. Which of the statements about the reaction given below are NOT correct?



- (i) Lead is reduced
- (ii) Carbon dioxide is oxidised
- (iii) Carbon is oxidised
- (iv) Lead oxide is reduced

- (i) (a) and (b)
- (ii) (a) and (c)
- (iii) (a), (b) and (c)
- (iv) all

Ans: (i) (a) and (b)

2. $\text{Fe}_2\text{O}_3 + 2 \text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

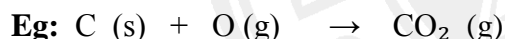
The above reaction is an example of

- a) Combination reaction
- b) Double displacement reaction
- c) decomposition reaction
- d) displacement reaction

Ans: (d) displacement reaction

3. What are combination reactions? Give one example.

Ans: Reactions in which a single product is formed from two or more reactants are called combination reactions.



4. What are decomposition reactions? Give one experiment to demonstrate a decomposition reaction.

Ans: The reactions in which a compound is broken down into two or more simpler substances by the action of heat or by supplying energy are called decomposition reactions.

Experiment: Let us take about 4g of calcium carbonate, CaCO_3 in a hard glass test tube fitted with a delivery tube containing lime water.

The tube is heated over the flame of a spirit lamp or burner.

It is observed that lime water turns milky. When calcium carbonate is heated, it decomposes to calcium oxide and carbon dioxide gas.

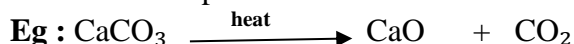


Fig. Heating of calcium carbonate and giving out carbon dioxide gas which turns lime water milky.

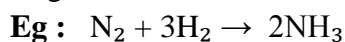


5. Why are decomposition reactions called the opposites of combination reactions ?

Ans: In decomposition reactions a substance is decomposed into two or more substances.



On the other hand in combination reactions two or more substances combine together to give a single substance.



Therefore decomposition reactions are opposite of combination reactions.

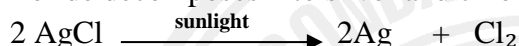
6. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

Ans:

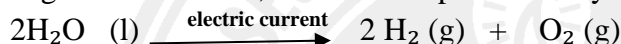
(i) Calcium carbonate decomposes into CaO and CO₂ on heating.



(ii) Silver chloride decomposes into silver and chlorine in presence of light

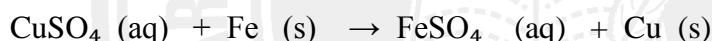


(iii) On passing electric current, water decomposes into hydrogen and oxygen

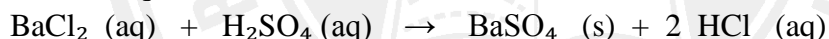


7. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans: In displacement reaction a more reactive element displaces another less reactive element from its solution



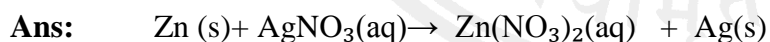
On the other hand in double displacement reaction there is mutual exchange of ions between the compounds in their aqueous state.



8. What is a displacement reaction? Give one example.

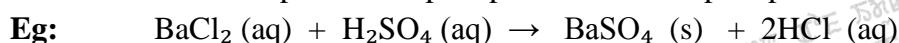
Ans : *(Please see above)*

9. In the refining of silver, silver can be recovered from silver nitrate solution by adding zinc metal. Write down the reaction involved.



10. What is a precipitation reaction ? Explain it by giving one example.

Ans: A reaction that produces a precipitate is called a precipitation reaction.



In the above reaction a white substance (BaSO₄) is formed as precipitate . Thus the reaction is a precipitation reaction.

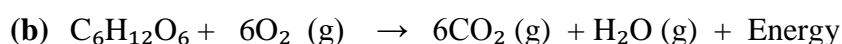
11. What are exothermic and endothermic reactions? Give two examples each.

Ans: Reactions which take place with the evolution of energy in any form are called exothermic reactions.

Eg :



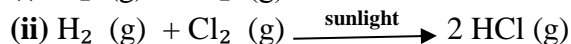
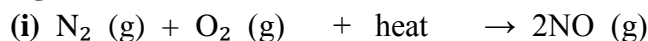
Methane





The reactions in which energy is absorbed are called endothermic reactions.

Eg:



12. Why is respiration considered an exothermic reaction?

Ans: Exothermic reaction: During respiration oxygen present in the blood combines with glucose in the body cells and converted into CO_2 and H_2O with the liberation of energy.

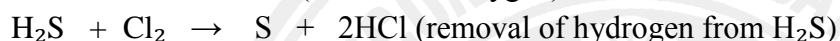


13. Explain the terms (a) oxidation and (b) reduction with two examples each.

Ans:

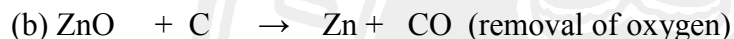
(a) Oxidation is a process which involves gain of oxygen or loss of hydrogen.

Eg: $\text{Cu} + \text{O}_2 \rightarrow \text{CuO}$ (addition of oxygen)



Reduction is a process which involves loss of oxygen or gain of hydrogen.

Eg:



14. Why does painted iron not rust?

Ans: Painting prevents the iron from coming in contact with the damp air thereby reducing oxidation. Thus painting prevents iron from rusting.

15. Fat and oil containing food items are flushed with nitrogen, why?

Ans: It is because flushing the food items with nitrogen prevents them from oxidation thus preserving the food item.

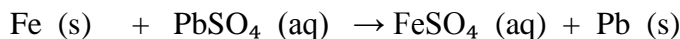




EXTRA QUESTIONS & ANSWERS

1. When iron is added to CuSO_4 solution copper is displaced and iron forms FeSO_4 in solution. Will Fe displace Pb from PbSO_4 solution and Zn from ZnSO_4 solution? Give reason in support of your answer.

Ans: Fe will displace Pb from PbSO_4 solution because Fe is more reactive than Pb. Thus iron displaces lead from its solution as



Whereas Fe cannot displace Zn from ZnSO_4 as Fe is less reactive than Zn. So there will be no reaction.

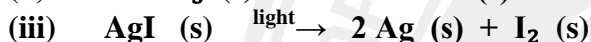
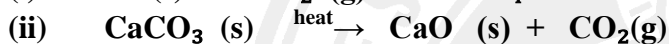
2. Citing an example define neutralisation reaction.

Ans: Reaction between hydrochloric acid, HCl and sodium hydroxide, NaOH lead to the formation of sodium chloride, NaCl and water, H_2O .



A reaction between an acid and a base producing salt and water is called neutralisation reaction.

3. Identify the type of each reactions:



Ans:

(i) Combination reaction

(ii) Decomposition reaction

(iii) Photochemical reaction

4. In the reaction, $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$, Which atom undergoes oxidation?

Ans: Na undergoes oxidation as it loses one electron to form sodium ion, Na^+ .

5. Hydrogen is more reactive than Ag but less reactive than Zn. What will happen when

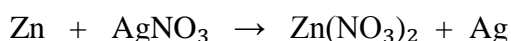
(i) a piece of Ag metal is placed in dilute HCl?

(ii) a piece of Zn metal is placed in aqueous AgNO_3 solution?

Ans:

(i) No reaction will take place between Ag and dilute HCl. Because, Ag is less reactive than hydrogen. Therefore Ag cannot displace hydrogen from dilute HCl.

(ii) As zinc is more reactive than Ag, Zn will displace Ag from AgNO_3 solution forming zinc nitrate and silver.

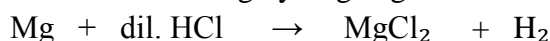


6. What are catalysts?

Ans: Catalysts are substances which increase or decrease the rate of chemical reactions without themselves being consumed.

7. In two test tubes containing dilute HCl solution, Mg and Cu metals are added separately. Explain what will happen in each of the test tubes? (2013N) 2m

Ans: HCl reacts with Mg as Mg is more reactive than hydrogen. Therefore Mg will displace hydrogen from HCl releasing hydrogen gas.



But no reaction will take place between Cu and HCl as Cu is less reactive than hydrogen and hence cannot displace hydrogen from HCl.



8. Now a-days antioxidants are widely used in dietary supplements for the prevention of diseases preservatives in food and in cosmetics. What is the chemical nature of these antioxidants?

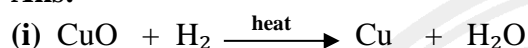
Ans: Antioxidants inhibit oxidation.

9. A piece of metal when immersed in aqueous copper sulphate solution discharges the blue colour of the solution. Predict the position of the metal relative to copper in the activity series of metals.

Ans: The metal is at the higher order than copper in the activity series.

10. Describe two reactions to prove that oxidation and reduction reactions occur simultaneously.

Ans:



In this reaction, addition of oxygen takes place to hydrogen to give water. So H_2 is oxidised to H_2O .

Again oxygen is removed from copper oxide. So CuO is reduced to Cu .



In this reaction HCl is losing hydrogen to form Cl_2 . So HCl is oxidised to Cl_2 .

Again MnO_2 loses oxygen to form MnCl_2 . Therefore MnO_2 is reduced to MnCl_2 .

Both in the above reactions oxidation and reduction occur simultaneously.

11. What are the gases collected at the electrodes during electrolysis of water?

Ans: Hydrogen is collected at cathode and oxygen is collected at anode.

12. How will you recognise the gases produced at electrodes during electrolysis of water?

Ans: The gases collected over the cathode burns with a pop sound. This shows that the gas is hydrogen.

If we bring a glowing splinter at the mouth of the gas collected at anode it bursts into flame. This shows that the gas is oxygen.

13. During electrolysis of water how do you compare the amount of gas collected at both the electrodes?

Ans: During electrolysis of water, the volume of gas collected over the cathode (hydrogen) is double the amount of the gas collected over the anode (oxygen).

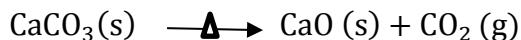




PROBABLE QUESTIONS FROM TEXT BOOK

Q1. What are the decomposition reactions? Give one example.

Ans: The type of chemical reactions in which a compound is broken down into two or more simpler substances by using any form of energy is known as decomposition reaction.



Q2. Describe decomposition reaction taking an example each of (i) Thermal decomposition (ii) Electrical decomposition and (ii) photochemical decomposition.

Ans:

(i) The chemical reaction in which a compound is broken down into two or more simpler substance by the action of heat is known as thermal decomposition.

OR

Decomposition reaction caused by heat energy is known as thermal decomposition.

Example: $\text{CaCO}_3(\text{s}) \xrightarrow{\text{Heat}} \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

(ii) Decomposition reaction caused by passing electricity in a salt solution is known as electrical decomposition

Example: $2\text{NaCl}(\text{l}) \xrightarrow{\text{Electricity}} 2\text{Na}(\text{s}) + \text{Cl}_2(\text{g})$

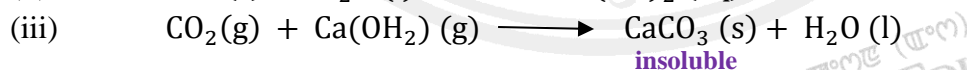
(iii) Decomposition reaction caused by the action of light is known as photochemical decomposition.

Example: $2\text{AgCl}(\text{s}) \xrightarrow{\text{Sunlight}} 2\text{Ag}(\text{s}) + \text{Cl}_2(\text{g})$

Q3. White solid substance A on heating strongly decomposes to give another white substance B and a gaseous substance B is soluble in water. When CO_2 is passed into the solution it turn milky. Identify A and B and give the relevant equation for the changes.

Ans: A is calcium carbonate (CaCO_3) and B is calcium oxide (CaO).

Equations:



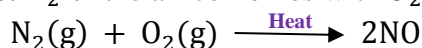
Q4. Burning of Magnesium metal cannot be extinguished by carbon dioxide. Give reason.

Ans: Magnesium is highly reactive metal, its affinity for oxygen is higher than that of Carbon. Magnesium combines with oxygen of carbon dioxide and continues to burn in the gas.



Q5. What chemical change is expected in the air when lightening occurs during thunderstorm? (2015)

Ans: N_2 of the air combines with O_2 to form NO under the influence of electric spark.



Nitric oxide



- Q6. Why is respiration considered as an exothermic process? Represent the reaction that takes place with glucose during the process.

OR

Respiration is an exothermic reaction whereas decomposition reactions are endothermic. Explain.

OR

Give an example of endothermic and exothermic reaction.

Ans: Exothermic reaction: During respiration oxygen present in the blood combines with glucose in the body cells and converted into CO_2 and H_2O with the liberation of energy.



Endothermic reaction: Photosynthesis is an endothermic process because during photosynthesis chlorophyll (green pigments) present in the leaf of the plants absorb sunlight and convert CO_2 and H_2O into glucose.



- Q7. What changes takes place when colourless lead nitrate is heated in a dry test tube? Give the relevant equation.

Ans: The colourless lead nitrate becomes yellow due to the formation of lead monoxide (PbO). Brown fumes are observed due to the evolution of nitrogen dioxide (NO_2) gas.



- Q8. What is double displacement reaction? Give one example each of the following double displacement reactions which takes place: (i) with the formation of a precipitate (ii) with the evolution of a gas.

Ans: A reaction in which two different atoms or group of atoms or ions are mutually exchanged between two reactants or compounds in their solution state is known as double displacement reaction.



- Q9. What are oxidation and reduction reactions?

Ans:

Oxidation:

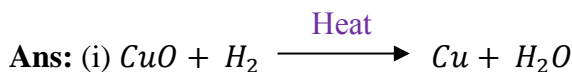
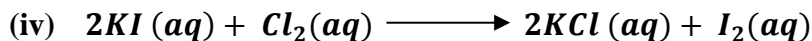
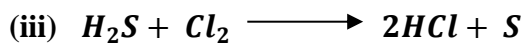
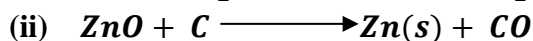
- (i) Addition of oxygen and removal of hydrogen.
- (ii) Addition of electronegative element and removal of electropositive element.
- (iii) Loss of valence electron (s), e.g. $Na \longrightarrow Na^+ + e^-$

Reduction:

- (i) Addition of hydrogen and removal of oxygen.
- (ii) Addition of electropositive element and removal of electronegative element.
- (iii) Gain of valence electron (s). e.g. $Cl + e^- \longrightarrow Cl^-$



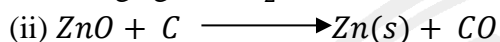
Q10. Identify the substances which is oxidised and reduced from the following chemical equations and also identify the oxidising and reducing agents:



H_2 is oxidised to H_2O and CuO is reduced to Cu .

Oxidising agent: CuO

Reducing agent: H_2



C is oxidised to CO and ZnO is reduced to Zn .

Oxidising agent: ZnO

Reducing agent: C



H_2S is oxidised to S and Cl_2 is reduced to HCl .

Oxidising agent: Cl_2

Reducing agent: H_2S



KI is oxidised to I_2 and Cl_2 is reduced to KCl .

Oxidising agent: Cl_2

Reducing agent: KI

Q11. What happens when

(i) colourless $AgNO_3$ solution is stored in a copper vessel?

(ii) blue $CuSO_4$ solution is stirred with an iron rod?

Write the chemical equations?

Ans:

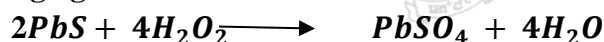
(i) Copper displaces Ag from $AgNO_3$ and form $Cu(NO_3)_2$ solution which is bluish in colour.



(ii) Fe displaces Cu from $CuSO_4$ (blue colour) solution and form $FeSO_4$ which is greenish in colour.



Q12. What is redox reaction? In the following reaction, identify the substance oxidised and the oxidising agent:



Ans: A reaction in which oxidation and reduction happens simultaneously is known as redox reaction.

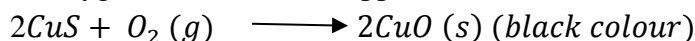
Here PbS is oxidised to $PbSO_4$

Oxidising agent is H_2O_2 (Hydrogen peroxide)

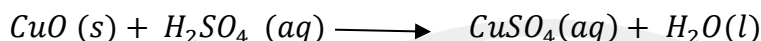


- Q13.** When copper metal is heated in vacuum its colour remains unchanged but the heated metals become black on exposure to atmospheric air. The blackened metal part on washing with dilute sulphuric acid gives a blue colour solution. Explain the observations giving chemical reactions involved.

Ans: In vacuum, the metal does not undergo reaction when exposed to in the heated metal react with oxygen to form black copper oxide (combination reaction).



On treating with dilute sulphuric acid, the black CuO reacts with the acid to form blue copper sulphate solution (neutralisation reaction).



- Q14.** What will happen if a zinc strip and a copper strip are dipped separately in two test tubes containing iron (II) sulphate solution? If any reaction will occur, write the chemical equation.

Ans: Zinc will displace iron from iron (II) sulphate as Zinc is more reactive than iron.



No reaction will occur in the test tube in which copper strip is dipped as Cu is less reactive than iron.

- Q15.** Double displacement reaction does not take place when aqueous solution of $NaNO_3$ and KCl are mixed together.

Ans: No insoluble (ppt) or sparingly soluble salt is formed by the reaction.

- Q16.** Predict whether a reaction will occur or not in the following cases. If a reaction will occur write the equation for it.

(a) Hydrochloric acid (aq) + silver \rightarrow

(b) Iron (II) sulphate (aq) + Aluminium

Ans:

(a) Hydrochloric acid (aq) + silver \rightarrow No reaction

(b) Iron (II) sulphate (aq) + Aluminium \rightarrow

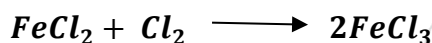


- Q17.** Silver bromide is always stored in dark coloured bottles. Give reason

Ans: Dark coloured bottles cut off light and prevents the decomposition of silver bromide into silver and bromine by light.



- Q19.** What is an oxidation reaction? In the given reaction



Which one is oxidised and which one is reduced?

Ans: Definition (Please see in Q 9)

$FeCl_2$ is oxidised because valency of Fe changes from +2 to +3. (i.e. loses one electron).

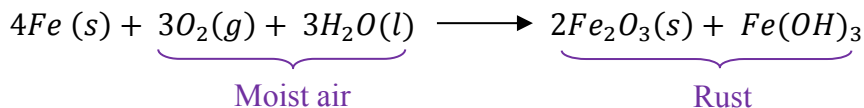
Cl_2 is reduced because valency of Cl_2 changes from 0 to -1. (i.e. gain one electron).



Q20. What is rust? How is it formed? Give the relevant equation.

Ans: Rust is a mixture of ferric oxide and ferric hydroxide (commonly known as hydrated ferric oxide), which is reddish brown in colour.

It is formed by the action of moist air (oxygen and water vapour) on the surface of iron articles.



Q21. What are the ways for preventing rusting (corrosion)?

Ans: (i) Oiling and greasing (ii) painting (iii) Galvanisation (iv) electroplating and (v) alloying.

Q22. What is rancidity?

Ans: The oxidation of fats or oils in foods resulting into bad smell and taste is called rancidity.

Example: rancidity of butter on keeping for a longer time.

Q23. Name the gas which can be used for storage for food containing fats or oils for a long time.

Ans: Nitrogen

Q24. What is catalysis? Give an example.

Ans: The phenomenon of increasing the rate of a chemical reaction by a substance without itself being consumed is known as catalysis. Eg. Iron, V_2O_5

Q25. What is negative catalysis? Give an example.

Ans: The phenomenon of decreasing the rate of a chemical reaction by a substance without itself being consumed is known as negative catalysis. **E.g.** Glycerine.

