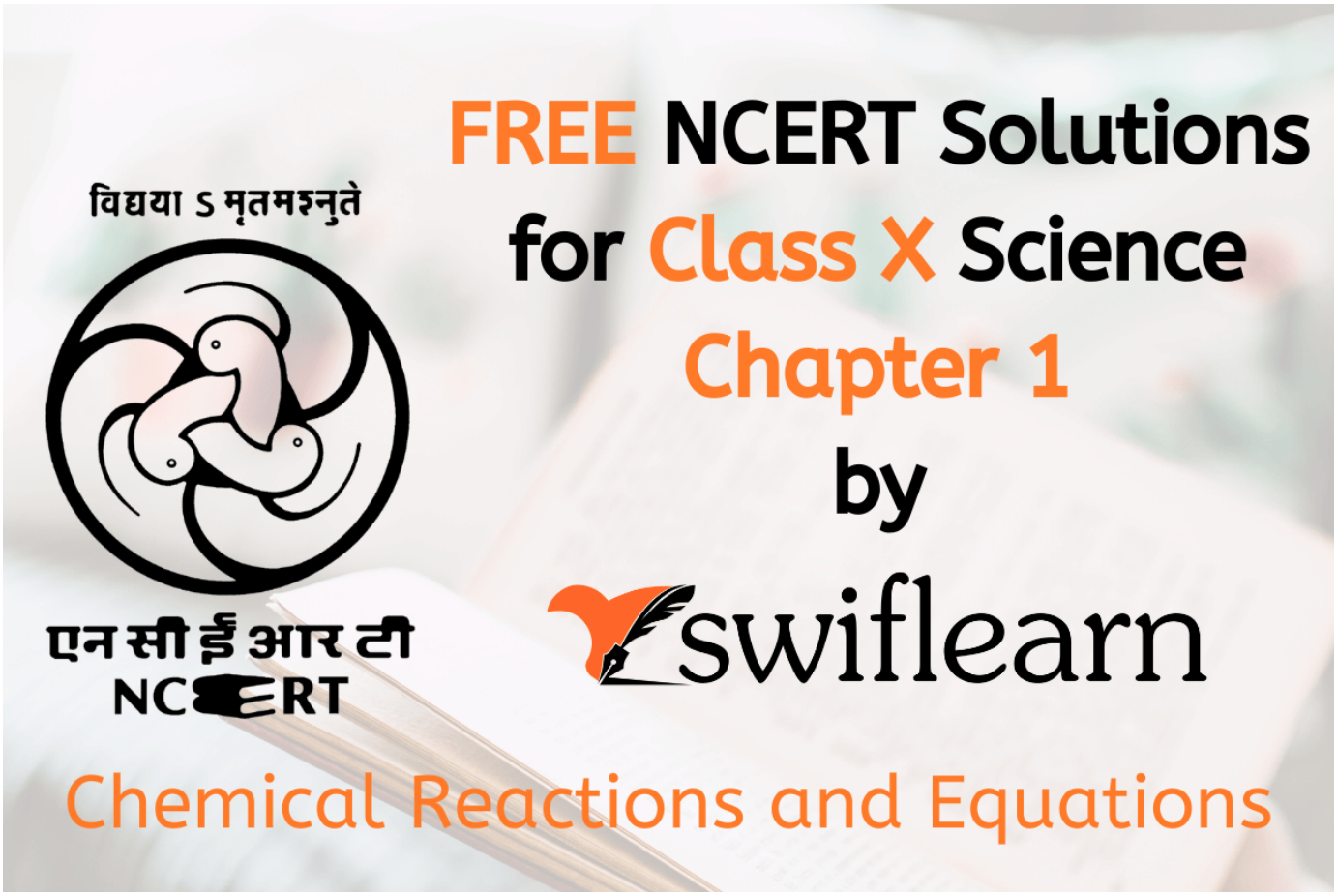
NCERT Solutions for Class 10 Science Chapter 1 : Chemical Reactions and Equations



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Chapter 1 of class 10 Science is Chemical reactions and equations. In this chapter, you will get to know about different methods for writing chemical equations. You will also learn to balance those equations. This chapter provides an understanding of the different types of chemical reactions like Disproportion reaction, Combination Reaction, etc. This chapter has a total of 20 questions. This will help you to strengthen your concepts regarding balancing chemical equations.

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NCERT Solutions for Class 10 Science Chapter 1 Chemical Reactions and Equations PDF

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NCERT Solutions for Class 10 Science Chapter 1
Chemical Reaction and Equation

Identify the substances that are oxidized and the substances that are reduced in the following reactions.
(i) $4Na\,(s) + O_2\,(g) \rightarrow 2Na_2O(s)$
(ii) $CuO\,(s) + H_2\,(g) \rightarrow Cu\,(s) + H_2O\,(l)$

Solution:

(i) Sodium [Na] is oxidized and oxygen gets reduced.
$4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$

(ii) Hydrogen (H_2) is oxidized to water (H_2O) and Copper oxide (CuO) is reduced to copper (Cu).

Exercise Chapter: 1

Question 1:

Which of the statements about the reaction below are incorrect?
$2PbO(s) + C(s) \rightarrow 2Pb(s) + CO_2(g)$
(a) Lead is getting reduced.
(b) Carbon dioxide is getting oxidized.
(c) Carbon is getting oxidized.
(d) Lead oxide is getting reduced.

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

Solution:

Exercise: 1.1

Question 1:
Why should a magnesium ribbon be cleaned before burning in air?

Solution:
Magnesium be a very reactive metal it reacts with oxygen and forms a layer of MgO (magnesium oxide) on the surface of metal. Magnesium oxide is a stable compound and

does not react any further. Hence, magnesium ribbon has to be cleaned with sand paper used for removal of this layer.

Question 2:
Write the balanced equation for the following chemical reactions.
(i) Hydrogen + Chlorine → Hydrogen chloride
(ii) Barium chloride + Aluminiumsulphate → Bariumsulphate + Aluminum chloride
(iii) Sodium + Water → Sodium hydroxide + Hydrogen

Solution: Refer pdf.

Question 3:
Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give Insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Solution: Refer pdf.

Exercise: 1.2

Question 1
A solution of a substance 'X' is used for white washing.
(i) Name the substance 'X' and write its formula.
(ii) Write the reaction of the substance 'X' named in (i) above with water.

Solution:
(i) Substance X is calcium oxide (common name quick lime).
Its chemical formula is CaO .
(ii) Calcium hydroxide is formed when Calcium oxide reacts with water to.
This is a combination reaction. 2 ( )2
CaO H O Ca OH + →

Question 2:
Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Solution: Refer pdf.

Exercise: 1.3

Question 1:
Why does the color of copper sulphate solution change when an iron nail is dipped in it?

Solution:

When iron nail is dipped in the copper sulphate

(CuSO4) solution, the more reactive metal

(Iron) replaces the less reactive metal (Copper) from the copper sulphate

(CuSO4) solution.

Iron then forms a green compound called ferrous sulphate

(FeSO4) .

4 4 Fe CuSO FeSO Cu + → +

Question 2:
Give an example of a double displacement reaction other than the one given in Activity1.10.

Solution:

(i)

2 KBr aq BaI aq aq BaBr s ( ) + → + 2 2 ( ) ( ) ( )

(ii)

(3 2 3)2

2 2 KI Pb NO PbI KNO + → +

Question 3:
Identify the substances that are oxidized and the substances that are reduced in the following reactions.
(i) 4Na (s) + O2 (g) → 2Na 2O(s)
(ii) CuO (s) + H2 (g) → Cu (s) + H2O (l)

Solution:

(i) Sodium [Na] is oxidized and oxygen gets reduced.

4 2 Na s O g Na O s ( ) + → 2 2 ( ) ( )

(ii) Hydrogen (H2) is oxidized to water (H2O) and Copper oxide

( ) Cu O is reduced to copper (Cu).

Exercise Chapter: 1

Question 1:
Which of the statements about the reaction below are incorrect?
$2PbO(s) + C(s) \rightarrow 2Pb(s) + CO_2(g)$
(a) Lead is getting reduced.
(b) Carbon dioxide is getting oxidized.
(c) Carbon is getting oxidized.
(d) Lead oxide is getting reduced.
(i) (a) and (b)
(ii) (a) and (c)
(iii) (a), (b) and (c)
(iv) all

Solution:

As it is clearly evident from the reaction that Pb is getting oxidized and CO_2 is getting reduced.

Thus, (i) (a) and (b) is correct answer.

Question 2:
$Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$ the above reaction is an example of a
(a) Combination reaction.
(b) Double displacement reaction.
(c) Decomposition reaction.
(d) Displacement reaction.

Solution:

(d) This is an example of a displacement reaction.

Question 3:
What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.
(a) Hydrogen gas and iron chloride are produced.
(b) Chlorine gas and iron hydroxide are produced.
(c) No reaction takes place.
(d) Iron salt and water are produced.

Solution:

(a) Hydrogen gas [H_2] and iron chloride [$FeCl_2$]. The reaction is as follows:

$Fe + 2HCl \rightarrow FeCl_2 + H_2$

Question 4:
What is a balanced chemical equation? Why should chemical equations be balanced?

Solution:
In a balanced chemical reaction, the net mass of the reactants should be equal to the net mass of products and the number of atoms in the reactants side should be equal to the number of atoms in products side.
A chemical equation must be balanced to follow the Law of Conservation of mass.

Question 5:
Translate the following statements into chemical equations and then balance them.
(a) Hydrogen gas combines with nitrogen to form ammonia.
(b) Hydrogen sulphide gas burns in air to give water and sulpurdioxide.
(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
(d)Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Solution:
(a)
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g) + Heat$
Nitrogen + Hydrogen → Ammonia

(b)
$2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(aq) + 2SO_2(g)$
Hydrogen sulphide + oxygen → Water + sulpur dioxide

(c)
$Al_2(SO_4)_3(aq) + 3BaCl_2(aq) \rightarrow 2AlCl_3(aq) + 3BaSO_4(s)$
Aluminium sulphate + Barium chloride → Aluminium chloride + Barium sulphate

(d)
$2K(s) + 2H_2O \rightarrow 2KOH(aq) + H_2(g)$
Potassium + water → potassium + hydroxide

Question 6:
Balance the following chemical equations.
(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Solution: Refer pdf.

Question 7:
Write the balanced chemical equations for the following reactions.
(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminum + Copper chloride →Aluminum chloride + Copper
(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Solution:

(a Calcium hydroxide + Carbon dioxide Ca) → lcium carbonate + Water

The balanced reaction is

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b Zinc +Silver nitrate Zinc nitrate +Sil) → ver

$Zn + AgNO_3 \rightarrow Zn(NO_3)_2 + Ag$

$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

(c) Aluminum +Copper chloride → Aluminum chloride+ Copper

$Al + CuCl_2 \rightarrow AlCl_3 + Cu$

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d Barium chloride + Potassium sulphate) → Barium sulphate + Potassium Chloride

$BaCl_2+K_2SO_4 \rightarrow BaSO_4+ KCl$

$BaCl_2+K_2SO_4 \rightarrow BaSO_4+ 2KCl$

Question 8:
Write the balanced chemical equation for the following and identify the type of reaction in each case.
(a) Potassium bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium bromide(s)
(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide (g)
(c) Hydrogen (g) + Chlorine (g) → Hydrogen chloride (g)
(d) Magnesium(s) + Hydrochloric acid (aq) → Magnesium chloride (aq) + Hydrogen(g)

Solution:

(a)

$KBr (aq)+ BaI_2(aq) \rightarrow KI (aq) + BaBr_2(s)$

$2KBr (aq)+ BaI_2 (aq) \rightarrow 2 KI (aq) + BaBr_2(s)$

Thisis a double displacement reaction.

(b)

$ZnCO_3(s) \rightarrow ZnO(s)+CO_2 (g)$

This is a decomposition reaction.

(c)

$H_2(g)+Cl_2(g) \rightarrow HCl (g)$

$H_2(g)+Cl_2(g) \rightarrow 2HCl (g)$

This is a composition reaction.

(d)
$Mg(s) + HCl(aq) \rightarrow MgCl2(aq) + H2(g)$
$Mg(s) + 2HCl(aq) \rightarrow MgCl\ 2\ (aq) + H2(g)$
This is a single displacement reaction.

Question 9:
What does one mean by exothermic and endothermic reactions? Give examples.

Solution:
Exothermic Reaction: The reactions in which heat is released alongside with the formation of products are termed as exothermic reaction. Here, the energy of the reactants is more than that of the products. i.e. Energy of reactants > energy of products
Example: combustion of methane
$CH4(g) + 2O2(g) \rightarrow CO2 + 2H2O + heat$
Endothermic Reaction: The reaction in which energy is absorbed by the reactants to complete the reaction is called endothermic reaction. Here, the energy of the reactants is less than that of theproducts. i.e. Energy of reactants < energy of products
Example: Photosynthesis

Question 10:
Why respiration is considered an exothermic reaction? Explain.

Solution:
As explained in previous question exothermic reactions release heat or energy. During digestion, the food is broken to form glucose. Glucose then combines with oxygen in the cells of our body and provides energy. This reaction is termed as respiration. Since energy is released along the products it is an exothermic reaction
Glucose + oxygen $\rightarrow CO2$ + water + heat

Question 11:
Why decomposition reactions are called the opposite of combination reactions? Write equations for these reactions.

Solution:
In a Decomposition reaction a single reactant breaks down into various products.
Example: Decomposition of calcium carbonate [$CaCO3$]to form calcium oxide [CaO] and carbon dioxide [$CO2$]
$CaCO3 + Energy \rightarrow CaO + CO2$
On the other hand, Combination reactions are those reactions in which two or more reactants

combine to form a single product.

Example: Combination of Calcium oxide and carbon dioxide to produce calcium carbonate.

$CaO + CO_2 \rightarrow CaCO_3$ + energy

Question 12:
Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Solution:

(i) Thermal decomposition

$CaCO_3$ + heat $\rightarrow CaO + C$

(ii) Electrical decomposition

$2H_2O$ + electricity $\rightarrow 2H_2 + O_2$

(iii) Photolytic decomposition

$2AgCl$ + sunlight $\rightarrow 2Ag + Cl_2$

Question 13:
What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Solution: Refer pdf.

Question 14:
In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

Solution: Refer pdf.

Question 15:
What do you mean by a precipitation reaction? Explain by giving examples.

Solution:

A reaction in which an insoluble matter is formed is called a precipitation reaction. Example 1:

On mixing Na_2CO_3 solution with $CaCl_2$ solution, a white precipitate of $CacO_3$ is formed.

$Na_2CO_3 + CaCl_2 \rightarrow CaCO_3 + 2NaCl$

Question 16:
Explain the following in terms of gain or loss of oxygen with two examples

each.
(a) Oxidation (b) Reduction

Solution:
Oxidation: Addition of oxygen or electronegative element to a atom, molecule, or ion or removal of hydrogen or electropositive element from an atom, molecule, orion is called oxidation.
Example: $CO2+ H2 \rightarrow CO+H2O$ (addition of O)
$2Cu+O2 \rightarrow 2CuO$ (addition of O)
Reduction: Addition of hydrogen or electropositive element to an atom, molecule, or ion or removal of
Oxygen or electronegative element from a atom, molecule, or ion is called reduction.
Example: $CO2 + H2 \rightarrow CO+H2O$
$CuO+ H2 \rightarrow Cu+H2O$

Question 17:
A shiny brown colored element 'X' on heating in air becomes black in colour. Name the element 'X' and the black colored compound formed.

Solution:
Copper (Cu) is the given element X and the black color compound is copper (II) oxide (CuO).
Here copper reacts with oxygen to form the copper (II) oxide.
$2Cu + O2 \rightarrow 2CuO$
Shiny brown black

Question 18:
Why do we apply paint on iron articles?

Solution:
Iron articles get corroded easily in the presence of moisture and air. To prevent rusting, we have to
paint iron Articles. When we apply paint on the iron articles it cuts the contact of moisture and air with the surface and prevents corrosion.

Question 19:
Oil and fat containing food items are flushed with nitrogen. Why?

Solution:
Oil and fat containing food items get oxidized easily when they come in contact with oxygen. On the other hand nitrogen is an inert gas thus does not react easily. So the packets are flushed with nitrogen which replaces oxygen inside the packets. In this way, we can preserve food containing oil and fats for a long time.

Question 20:
Explain the following terms with one example each.
(a) Corrosion
(b) Rancidity

Solution:
(a) **Corrosion**: Corrosion is defined as a natural process in which the substance, usually metals oxidizes in the presence of air and moisture .Metal converts into its hydrated oxide.
Ex: Iron.
(b) **Rancidity**: Rancidity is defined as a process in which fats and oils are oxidized. This can be identified by change in taste and smell. For example, when you will keep for a long time any chips packet then the taste and smell of chips changes.

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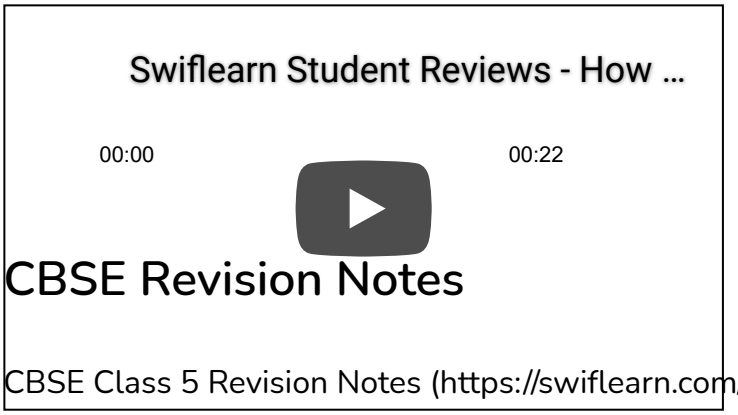

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