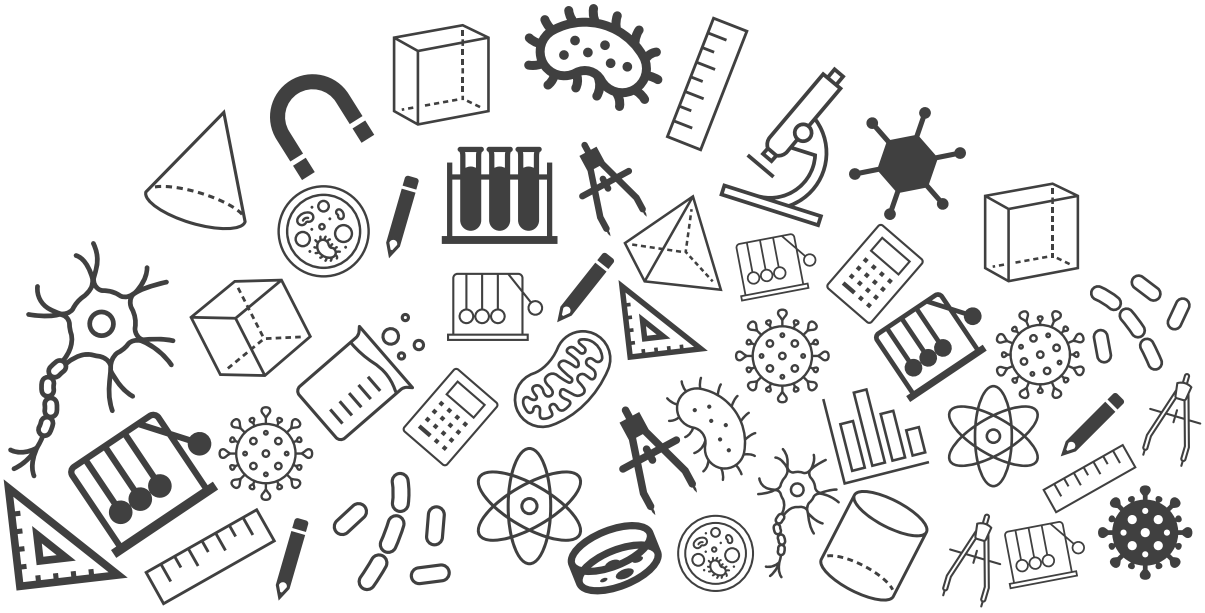
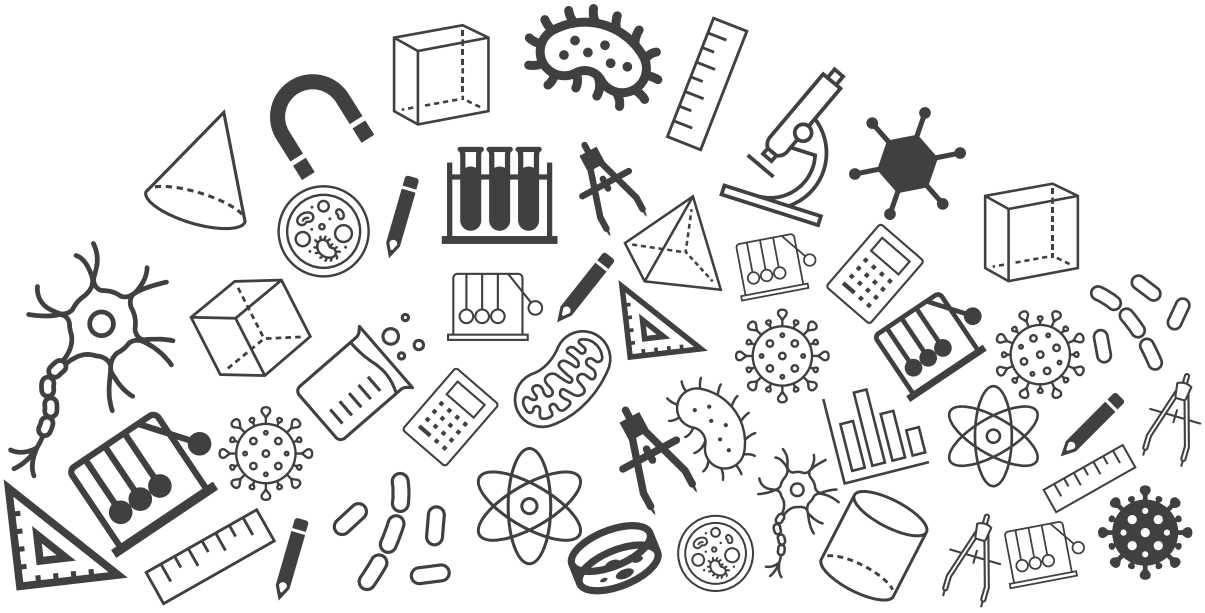
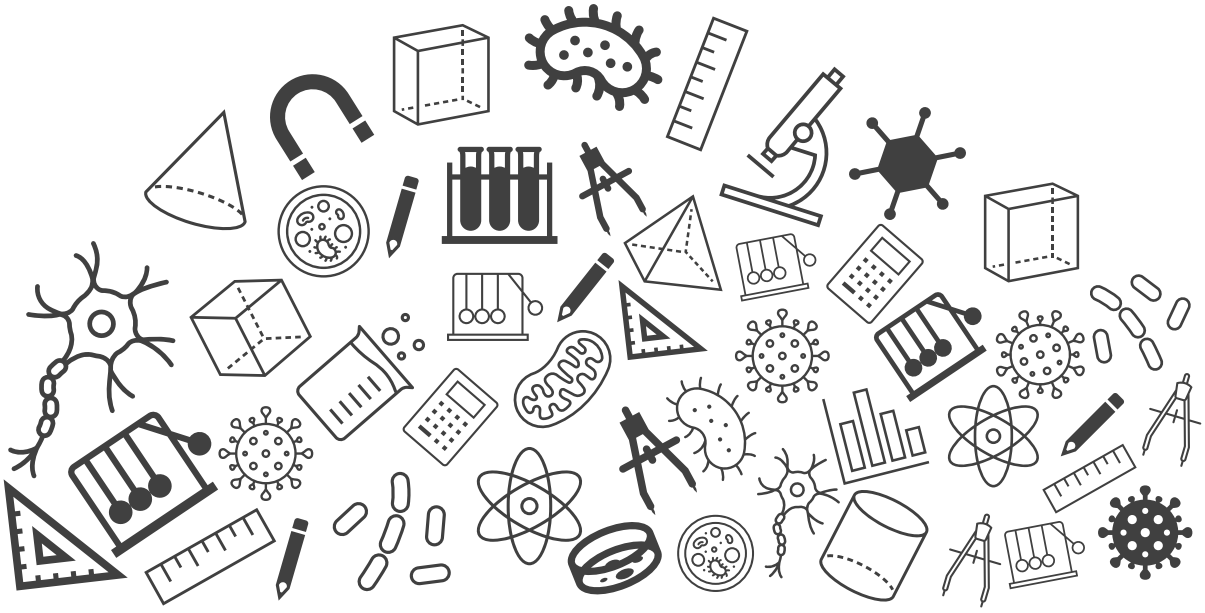
Grade 10: Science
Exam Important Questions



Chemistry



Chemical Reactions and Equations



Chemical Reactions and Equations

Topic : Exam Important Questions

1. Complete the missing components/variables given as x and y in the following reaction.

$$\mathrm{Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(x) + 2KNO_3(y)}$$

[1 Mark]

[Types of Chemical Reactions]

Solution:

The components x and y in the given reaction represent the physical states of the reactants and the products.

$\mathrm{x \rightarrow (s)}$

$\mathrm{y \rightarrow (aq)}$

The given reaction is:

$$\mathrm{Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)}$$

It is a precipitation and a double displacement reaction in which solid precipitates of lead iodide are formed. Therefore x represents solid (s) form of lead iodide and y represents aqueous (aq) form of potassium nitrate.

[1 Mark]

2. What is a balanced chemical equation? Why should chemical equations be balanced?

[2 Marks]

[NCERT]

[Balanced Chemical Reaction]

Solution:

A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation.

[1 Mark]

Chemical equations must be balanced because every chemical equation adheres to the law of conservation of mass, which states that matter cannot be created or destroyed.

In other words, formation of products involves rearrangement of atoms of the elements, hence, the mass of the reactants must be equal to the total mass of the products.

[1 Mark]

3. What happens when a piece of aluminium metal is added to dilute hydrochloric acid?

Also, write the balanced chemical equation if the reaction occurs.

Solution:

Aluminium being more reactive than hydrogen displaces it from dilute hydrochloric acid solution and hydrogen gas is evolved. Thus, this reaction is a displacement reaction.

[1 Mark]

The correct balanced equation is

$$2\mathrm{Al(s)} + 6\mathrm{HCl\ (aq)} \rightarrow 2\mathrm{AlCl_3(aq)} + 3\mathrm{H_2(g)}$$

[1 Mark]

4. Explain the following in terms of gain or loss of oxygen with an example each:

(A) Reduction.

(B) Oxidation.

[2 Marks]

(A) Reduction- Addition of hydrogen or removal of oxygen in a chemical reaction is called reduction.

[0.5 Marks]

For example:
$\mathrm{CuO} + \mathrm{H_2} \rightarrow \mathrm{Cu} + \mathrm{H_2O}$
Copper oxide is reduced to copper.

[0.5 Marks]

(B) Oxidation- Addition of oxygen or removal of hydrogen in a chemical reaction is called oxidation.

[0.5 Marks]

For example:
$2\mathrm{Cu} + \mathrm{O_2} \rightarrow 2\mathrm{CuO}$
Copper is oxidised to copper oxide.

[0.5 Marks]

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

[3 Marks]

Solution:
In a displacement reaction, a more reactive element displaces a less reactive element from its compound or salt solution.

[1 Mark]

For example: $\mathrm{CuSO_4(aq)} + \mathrm{Zn(s)} \rightarrow \mathrm{ZnSO_4(aq)} + \mathrm{Cu(s)}$

[0.5 Marks]

In a double displacement reaction, two compounds react by exchanging their ions to form new compounds. It is typically identified by the formation of a product that is a precipitate.

[1 Mark]

For example: $\mathrm{Na_2SO_4(aq)} + \mathrm{BaCl_2(aq)} \rightarrow \mathrm{BaSO_4(s)} + 2\mathrm{NaCl(aq)}$

[0.5 Marks]

6. Balance the following chemical equations and identify the type of chemical reaction.

(a) $\mathrm{Mg(s) + Cl_2(g) \rightarrow MgCl_2(s)}$
(b) $\mathrm{HgO(s) \xrightarrow{Heat} Hg(l) + O_2(g)}$
(c) $\mathrm{Na(s) + S(s) \xrightarrow{Fuse} Na_2S(s)}$
(d) $\mathrm{TiCl_4(l) + Mg(s) \rightarrow Ti(s) + MgCl_2(s)}$
(e) $\mathrm{CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)}$
(f) $\mathrm{H_2O_2(l) \xrightarrow{UV} H_2O(l) + O_2(g)}$

[3 Marks]
[Exemplar Question]
[Balanced Chemical Reaction]

Solution:
(a) $\mathrm{Mg(s) + Cl_2(g) \rightarrow MgCl_2(s)}$ Already balanced; Combination reaction
[0.5 Marks]
(b) $\mathrm{2HgO(s) \xrightarrow{Heat} 2Hg(l) + O_2(g)}$; Decomposition reaction
[0.5 Marks]
(c) $\mathrm{2Na(s) + S(s) \xrightarrow{Fuse} Na_2S(s)}$; Combination reaction
[0.5 Marks]
(d) $\mathrm{TiCl_4(l) + 2Mg(s) \rightarrow Ti(s) + 2MgCl_2(s)}$; Displacement reaction
[0.5 Marks]
(e) $\mathrm{CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)}$ Already balanced; Combination reaction
[0.5 Marks]
(f) $\mathrm{2H_2O_2(l) \xrightarrow{UV} 2H_2O(l) + O_2(g)}$; Decomposition reaction
[0.5 Marks]

7. A numismatist (coin collector) has been collecting gold coins, silver coins, and copper coins for a long time. One day he observed a black coating on silver coins and green coating on copper coins.

Which chemical process is responsible for these coatings. Also name the chemical formula of the black and green coatings.

[2 Marks]
[Types of Chemical Reactions]

Solution:
The coating occurred due to a chemical process called corrosion.
[1 Mark]
Black coating is due to deposit of silver sulphide (Ag_2S).
[0.5 Marks]

$$2Ag(s) + H_2S(g) \rightarrow Ag_2S(s) + H_2(g)$$

Green coating is due to the formation of basic copper carbonate ($CuCO_3$).
[0.5 Marks]

8. Classify the following as endothermic and exothermic reactions.

(a) Decomposition of ferrous sulphate

(b) Burning of natural gas

[2 Marks]

Solution:
A chemical reaction that includes the release of energy in the form of heat or light is known as an exothermic reaction.
Endothermic reactions are chemical reactions in which the reactants absorb heat energy from the surroundings to form products.

Decomposition of ferrous sulphate is exothermic reactions as heat is released in the reaction.
[1 Marks]
Burning of natural gas is endothermic as heat is absorbed during decomposition reaction.
[1 Mark]

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