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Class: X
Subject: Chemistry
Topic: Chemical reactions and equations
No. of Questions: 20

Q1. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans. When an iron nail is placed in a copper sulphate solution, iron displaces copper from copper sulphate solution forming iron sulphate, which is green is colour.

$$Fe_{(s)} + CuSO_{4(aq)} \longrightarrow FeSO_{4(aq)} + Cu_{(s)}$$

Iron — Copper sulphate (Blue colour) — Iron sulphate (Green colour) — Copper

Q2. In the equations given below, state giving reasons, whether substances have been oxidised or reduced. (i) $PbO + CO \rightarrow Pb + CO_2$ (ii) $H_2S + Cl_2 \rightarrow 2HCl + S$.

Ans. (i) Carbon monoxide is oxidised as it gains oxygen.
(ii) Chlorine is reduced as it gains hydrogen.

Q3. The oxidation reaction which produces heat and light is

A. Endothermic
B. Photochemical
C. Combustion
D. Exothermic

Ans. C

Q4. Define displacement

Ans. A reaction in which an atom or group of atoms present in a molecule is displaced by another atom is known as displacement reaction. For example,

$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

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Q5. Why is photosynthesis considered as an endothermic reaction?

Ans. Photosynthesis is an endothermic reaction. This is because light energy in the form of sun light is absorbed during the process of photosynthesis by green plants.

6. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$

Q6. The above reaction is an example of a

A. Combination reaction
B. Double displacement reaction
C. Decomposition reaction
D. Displacement reaction

Ans. D The given reaction is an example of a displacement reaction.

Q7. What are the characteristics of chemical reactions?

Ans. 1. Evolution of a gas
2. Formation of a precipitate
3. Change the colour
4. Change in temperature
5. Change in state.

Q8. To balance a chemical equation, can we change the formulae of either reactants or Products

Ans. No, we cannot change the chemical formulae of reactants or products to balance a chemical reaction.

Q9. What is the ratio of number of moles of reactants to the number of moles of products in the equation.

$H_2S\ (g) + SO_2\ (g) \_\_\_\_\_\rightarrow S(s) + H_2O\ (l)$

Ans. The balanced chemical equation is

$2H_2S\ (g) + SO_2\ (g) \text{ ------- } \rightarrow 3\ S\ (s) + 2\ H_2O\ (l)$

Total number of moles of reactants = 2 + 1 = 3

Total number of moles of products = 3 + 2 = 5

∴ ratio of moles of reactant to the number of moles of product is 3 : 5.

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Q10. The conversion of $K_2 Cr_2 O_7$ into $Cr_2 (SO_4)_3$ is a process of

A. Oxidation
B. Reduction
C. Decomposition
D. Substitution

Ans. B

Q11. Why are decomposition reactions called the opposite of combination reactions ? Write equations for these ractions.

Ans. In combination reaction two or more substances (elements or compounds) combine to form a single new product or compound.

Example: $2H_2 + O_2 \xrightarrow{\text{Combination}} \underset{\text{Water}}{2H_2O}$

These reactions in which a compound splits up into two or more simpler substances are known as decomposition reaction, Example,

$CaCO_3 \xrightarrow{\text{decomposition}} CaO+CO_2$

Thus it is clear that decomposition and combination reactions are opposite from each other.

Q12. Amino acid is formed by decomposition of which component of our diet?

A. Carbohydrate
B. Starch
C. Protein
D. Fat

Ans. C

Q13. A solution of $Na_2 CO_3$ is mixed with a solution of $CaCl_2$. Predict what happens.

Ans. The four ions involved are Na^+, CO_3^{2-}, Ca^{2+} and Cl^- .The combinations of the Na^+ and Cl^- and the Ca^{2+} and CO_3^{2-} produce the compounds NaCl and $CaCO_3$. If both of these compounds are soluble, no reaction occurs. In this case, however, $CaCO_3$ is insoluble. Thus a reaction occurs that we can illustrate with balanced reaction in molecular form.

$Na_2 CO_3 (aq) + CaCl_2 (aq) \rightarrow CaCO_3 (S) + 2NaCl(aq)$

The equation written in total ionic form is

$2Na^{+}(aq) + CO_3^{2-}(aq) + Ca^{2+}(aq)2Cl^{-}(aq)$

$\rightarrow CaCO_3(s) + 2\,Na^{+}\,2Cl^{-}(aq)$

The net ionic equation will be

$Ca^{2+}(aq) + CO_3^{2-}(aq) \rightarrow CaCO_3(s)$

Q14. The oxidation of iron to rust is a problem, but the oxidation of aluminium to aluminium oxide isnot why?

Ans. Iron oxidizes in presence of atmospheric oxygen and water to form iron oxide tri- hydrate ($Fe_2O_3.\,3H_2O$), known as rust. It peels off exposing fresh iron surface for further rusting. While, aluminium oxidized in presence of atmospheric oxygen to form a thin, transparent and non water-soluble layer of aluminium oxide (Al_2O_3), which shield the metal from further oxidation and maintains its metallic shine. Hence, the oxidation of iron to rust is a problem for structural engineers but the oxidation of aluminium oxide is not.

Q15. Can rancidity be retarded by storing foods away from light?

Ans. In the absence of light, the oxidation of fats and oils present in food is slowed down and hence the development of rancidity is retarded.

Q16. What are the different ways can make more informative about the chemical equation?

Ans. 1. By indicating the “physical states” of the reactants and products.
2. By indicating the “heat changes” taking place in the reaction.
3. By indicating the “conditions” under which the reaction takes place.

Q17. (a) Would you expect aluminium oxide to be a solid, liquid, or gas at room temperature?
(b) write the balanced chemical equation for the reaction of aluminium oxide with nitric acid.

Ans. (a) Because aluminium oxide is the oxide of a metal, we would expect it to be an ionic solid . indeed it is, and has a very high melting point, 2072^{o}C.
(b) In its compounds, aluminium has a 3 + charge, Al^{3+}, the oxide ion is O^{2-}, Consequently, the formula of aluminium oxide is A l_2O_3. Metal oxides tend to be basic and therefore to react with acids to form salts and water. In this case the salt formed is aluminium nitrate, $Al(NO_3)_3$. The balanced chemical equation is

$Al_2O_3(s) + 6HNO_3\ (aq) \longrightarrow 2Al(NO_3)_3(aq) + 3H_2O(l)$

Q18. Loss of electrons is called_____

A. Reduction
B. Oxidation
C. Can be oxidation or reduction
D. None of these

Ans. B

Q19. What is the difference between displacement and double displacement reactions? Write equation for these reactions.

Ans. In displacement reaction , more reactive metal can displace less reactive metal from its salt
$Zn(s) + CaCl_2\ (aq) \rightarrow ZnCl_2\ (aq) + Cu(s)$
In double displacement reaction, two compounds exchange their ions to form two new compounds e.g.,
$NaOH + HCl \rightarrow NaCl + H_2O$

Q20. A shiny brown coloured element 'X' on heating in air becomes black in Colour. Name the element 'X' and the black coloured compound formed.

Ans. X is copper.
Copper gets oxidised to copper oxide which is black in colour.

$2Cu(s) + O_2(g) \xrightarrow{heat} 2CuO(s)$

Copper oxygen copper oxide

(reddish brown) (black)