Solution

Class 10 - Science

Unit test chapter -1

1. **(a)** Reddish-brown
   Explanation: Copper Sulphate Solution ($CuSO_4$) is blue in colour. When an iron nail is placed in it, we can observe the following:
   i. reddish-brown deposits on iron (these are of Copper)
   ii. colour of the solution turns from blue to pale green.
   The formula for this reaction is: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
   Here, Fe is more reactive than Cu. So Fe displaces Cu to form Iron Sulfate and Copper.

2. **(b)** a black coating is formed
   Explanation: The colour of the coating is grayish black. When Zinc Reacts with ferrous sulphate zinc displaces iron forming zinc sulphate and iron metal is precipitated and settles on the surface of zinc granules. This is because zinc is more electropositive than iron so it can displace iron from its solution. Also, the solution turns colourless from light green.
   $FeSO_4\,(aq) + Zn\,(s) \rightarrow \underset{Black}{ZnSO_4\,(aq) + Fe\,(s)}$

3. **(a)** Rancidity
   Explanation: Rancidity is defined as chemical decomposition of oils and fats which in other words is spoiling food materials that is difficult for consumption. It is used to denote unpleasant odours and flavours in foods resulting from deterioration in the fat or oil portion of food.

4. **(d)** Zinc
   Explanation: Platinum, silver, and gold are more active than copper. So, no effect on copper sulfate.
   The zinc displaces the copper from the copper sulfate:
   $CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$
   Here Zn will change the blue colour of copper sulphate solution.

5. **(d)** $FeSO_4$
   Explanation: Copper Sulphate Solution ($CuSO_4$) is blue in colour. When an iron nail is placed in it, we can observe the following:
   i. reddish-brown deposits on iron (these are of Copper)
   ii. colour of the solution turns from blue to light green.
   The formula for this reaction is: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
   Here, Fe is more reactive than Cu. So Fe displaces Cu to form Iron Sulfate and Copper.

6. **(c)** Double displacement reaction and precipitation reaction
   Explanation: It is double displacement as well as precipitation reaction because two compounds exchange their ions and one of the product formed is insoluble.
   $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
   Double decomposition takes place, due to the exchange of ions between the 2 substances. A white precipitate of barium sulphate is formed.

7. **(d)** Blue
   Explanation: When water is added to white coloured anhydrous copper sulphate, its colour changes to blue, indicating that the blue coloured copper sulphate pentahydrate is regenerated.
   $CuSO_4(s) \xrightarrow{Heat} CuO(s) + SO_3(g)$

8. **(d)** Heating copper wire in presence of air at high temperature
   Explanation: In the other given options here, there is no involvement of chemical reaction. When copper is heated in presence of air at high-temperature copper undergoes an oxidation reaction to give out copper oxide.

9. **(c)** Double displacement
Explanation: The reactions which involve the exchange of ions (cations and anions) between the reactants are called double displacement reactions.
AB + CD $\rightarrow$ AC + BD
In a double displacement reaction exchange of ions takes place. No substance is oxidized or reduced.

10. **(c)** [C] and [D]
Explanation: Zn will displace copper from copper sulphate solution. The solution will change colour from blue to colourless.
$$\underset{\text{Blue}}{zn + CuSO_4} \longrightarrow \underset{\text{Colourless}}{ZnSO_4 + Cu}$$
Zn will displace iron from iron sulphate and solution will change colour from green to colourless, due to formation of zinc sulphate.
$$\underset{\text{Pale green}}{Zn + FeSO_4} \longrightarrow \underset{\text{Colourless}}{ZnSO_4 + Fe}$$

11. **(c)** $CaCO_3$
Explanation: Marble is made of calcium carbonate, $CaCO_3$, which is also what limestone is made from. The only difference between limestone and marble is the crystalline structure. Limestone crystals are much smaller than that of marble, and limestone is much more porous.

12. **(a)** Both Precipitation reaction and Double displacement reaction
Explanation:
- Double decomposition takes place, due to the exchange of ions between the 2 substances. A white precipitate of barium sulphate is formed.
- $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
- $BaSO_4$ is insoluble in water. NaCl dissolves in water.
- $BaSO_4$ is Barium Sulphate
- NaCl is common salt of Sodium Chloride

13. **(c)** (i) and (iii)
Explanation: The reaction provided is a mixture of displacement and redox reaction because in this reaction oxygen displaces hydrogen in the ammonia. Here nitrogen is getting oxidized and oxygen is reduced.

14. **(b)** $BaSO_4$
Explanation: On mixing a solution of barium chloride with sodium sulphate, a white precipitate of barium sulphate is immediately formed. These reactions are ionic in nature.
$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

15. **(c)** Displacement reaction
Explanation: Reactions in which atoms or ions move from one compound to others to form a new compound are known as Displacement reactions.
Fe (s) + $CuSO_4$ (aq) $\rightarrow$ Cu(s) + $FeSO_4$(aq)
Fe being more reactive is able to displace Cu from $CuSO_4$ solution.

16. **(d)** Reactants - heat $\rightarrow$ Products
Explanation: Reactions that give out heat energy are called exothermic reactions. In an exothermic reaction, reactants form products and release energy.
reactants $\rightarrow$ products + energy.

17. **(b)** Corrosion
Explanation: Silver is known to be resistant to corrosion, as it does not oxidize easily. When silver is exposed to air, a layer of silver sulfide is formed on the surface.
$2Ag(s) + H_2S(g) \rightarrow Ag_2S(s) + H_2(g)$

18. **(d)** C (s) + 2S (s) $\rightarrow$ CS_2 (l) -92 kJ
Explanation: Reactions which involves absorption of energy are known as endothermic reactions.

92 kJ of heat energy is absorbed in forming one mole of CS_2.

19. **(b)** All statements are correct
Explanation: Some of the characteristics of a physical change are:
i. Temporary in nature.
ii. No energy change occur.
iii. Does not affect the internal structure of a substance, only the molecules are rearranged.
iv. No new substance is formed.
So all statements are correct.

20. **(b)** Calcium hydroxide
Explanation: Calcium hydroxide (traditionally called slaked lime) is an inorganic compound with the chemical formula $Ca(OH)_2$. It is a colourless crystal or white powder and is obtained when calcium oxide (called lime or quicklime) is mixed or slaked with water. It has many names including hydrated lime, caustic lime, builders' lime, slack lime, cal, or pickling lime. Calcium hydroxide is used in many applications, including food preparation. Limewater is the common name for a saturated solution of calcium hydroxide.

21. **(b)** A and D
Explanation: The condition produced by aerial oxidation of fats and oils in foods marked by unpleasant smell and test is called rancidity. Fatty foods become rancid because of oxidation means reaction with oxygen.

22. **(a)** Hydrogen gas and iron chloride are produced
Explanation: Metals react with acids to form metal salt and hydrogen gas

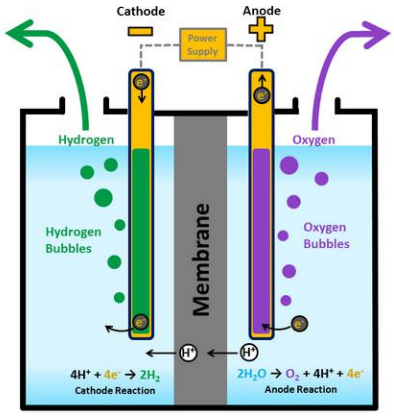
23. **(b)** A
Explanation: In I and II no reaction takes place, therefore. In III, green solution of $FeSO_4$ will change to colourless due to formation of zinc sulphate.
Zn(s) + $\underset{green}{FeSO_4(aq)} \rightarrow \underset{colourless}{ZnSO_4(aq)}$ + Fe(s)
In IV blue colour of $CuSO_4$ changes to colourless due to formation of zinc sulphate.
Zn(s) + $\underset{blue}{CuSO_4(aq)} \rightarrow \underset{colourless}{ZnSO_4(aq)}$ + Cu(s)

24. **(d)** Al is more reactive than Zn, Cu, Fe
Explanation: $2Al + 3ZnSO_4 \rightarrow Al_2(SO_4)_3 + 3\ Zn$
$2Al + 3CuSO_4 \rightarrow Al_2(SO_4)_3 + 3\ Cu$
$2Al + 3FeSO_4 \rightarrow Al_2(SO_4)_3 + 3Fe$
Al is more reactive than Zn, Cu and Fe because it displaces them from their salt solution.

25. **(a)** Exothermic reaction
Explanation: The decomposition of plant and animal organic waste by the action of microbes into useful compost is an exothermic reaction because a large amount of energy is released in this process. It is different from other chemical reactions, as they need the energy to break the bond. But in these reactions, the breakdown is carried out by microbes.

26. **(b)** cathode, anode
Explanation: According to electrolysis reaction, H^+ ions pick up electrons from the cathode and get

reduced to H_2 gas, while oxide ions lose their electrons at the anode and get oxidized to oxygen gas.



27. **(a)** Fe_2O_3 is getting reduced

Explanation: Fe is obtained by the reduction of Fe_2O_3. Al_2O_3 is obtained by the oxidation of Al.The reaction of Iron (III) oxide (Fe_2O_3), with aluminium is used to join railings of railway tracks or cracked machine parts. This reaction is known as the thermite reaction.

28. **(d)** CO, Fe_2O_3

Explanation: $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Elements or compounds in which oxygen or non-metallic element is added or hydrogen or metallic element is removed are called to be oxidized.
CO is oxidized since it gains oxygen
The addition of hydrogen or metallic element or removal of oxygen or non-metallic element from a compound is called reduction.
Fe_2O_3 is reduced since it loses oxygen.

29. **(b)** (i) and (iv)
Explanation: In beaker A:

$NaOH + H_2O \rightarrow Na^+ + OH^- + H_2O$ + heat

In beaker B:
$CuSO_4(s) + 5H_2O(l) \rightarrow CuSO_4.5H_2O(s)$

Therefore in both A and B exothermic reactions are taking place resulting in the rise in temperature.
On the other hand in beaker C, an endothermic reaction is taking place as heat is being absorbed, resulting in a decrease in temperature.

$NaCl + H_2O + heat \rightarrow Na^+ + Cl^- + H_2O$

30. **(c)** Pale green
Explanation: $FeSO_4$ is chemical formula of Iron(II) sulphate or ferrous sulphate. The colour of ferrous sulphate solution is pale green.

31. **(d)** (ii) and (iii)
Explanation: When Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by the liberation of heat. It proves the reaction is exothermic. The pH of the solution will be more than 7 because oxides and hydroxides of metals are alkaline.

32. **(d)** (i), (ii) and (iv)
Explanation: Here oxygen combines with water to get oxidized. Oxygen is removed from water hence it is getting reduced. Water is providing oxygen and it acts as an oxidizing agent.

33. **(a)** Oxygen
Explanation: Oxidation is the process of being oxidized. A substance is said to be oxidized when it loses electrons to the oxidizer or gains oxygen atoms. The oxidizer is the substance that oxidizes. The most common oxidizer is Oxygen. Since it is so abundant, we naturally connote oxygen to be required for burning.
When things burn, they get oxidized. Complex molecules get reduced to simpler ones. For example, wood

on combustion will give carbon dioxide and water as its main products.
E is oxidized and oxygen is reduced.

34. **(b)** Law of Conservation of mass
Explanation: Balancing a chemical reaction follows the law of conservation of mass. According to the Law of Conservation of Mass, mass can neither be created nor destroyed in a chemical reaction. To obey this law, the total mass of elements present in reactants must be equal to the total mass of elements present in products.

35. **(d)** D
Explanation: Aluminum is a silvery-white, ductile metallic element, the most abundant in the earth's crust but found only in combination, chiefly in bauxite. Having good conductive and thermal properties, it is used to form many hard, light, corrosion-resistant alloys.

36. **(a)** (i) and (ii)
Explanation: The exothermic process is the one that releases an enormous amount of heat. When water reacts with water and acid reacts with water it releases an enormous amount of heat.

37. **(b)** CuO, H_2
Explanation: $CuO + H_2 \rightarrow Cu + H_2O$
In this reaction, oxygen is removed from copper, and oxygen is added to hydrogen. So, the cupric oxide is reduced to copper, and hydrogen is oxidized to water. Cupric oxide is an oxidizing agent and hydrogen is a reducing agent.

38. **(c)** (iv) only
Explanation: Ammonium and Barium are getting displaced from their respective salts. Hence this is a double displacement reaction.

39. **(c)** Soft and dull
Explanation: When you dip an iron nail in $CuSO_4$, iron replaces copper from $CuSO_4$, since it is more reactive than copper. The displaced copper gets deposited on the nail, which is soft and dull in nature.
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

40. **(c)** Barium chloride is mixed with sodium sulphate solution
Explanation: On mixing a solution of barium chloride with sodium sulphate, a white precipitate of barium sulphate is immediately formed. These reactions are ionic in nature.
$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$

41. **(a)** A, B and D
Explanation: Fe is oxidized water is reduced so Fe is a reducing agent.

42. **(d)** $NH_4Cl \rightarrow NH_3 + HCl$
Explanation: Decomposition reactions are those in which a substance splits into two or more simpler substances.
A general decomposition reaction can be represented as $AB \rightarrow A + B$.
NH_4Cl breaks up into two simple substances. So, the given reaction is a decomposition reaction.

43. **(a)** (A)
Explanation: A balanced chemical equation means that the number of atoms of each element is equal on both sides. Thus, the law of conservation of mass holds true.

44. **(b)** Displacement reaction
Explanation: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
It is a type of displacement reaction in which Cu is being displaced from its solution which is an exothermic reaction.

45. **(a)** Combination reaction
Explanation: A combination reaction (also known as a synthesis reaction) is a reaction where two or more elements or compounds (reactants) combine to form a single compound (product).
$CaO + H_2O \rightarrow Ca(OH)_2$
So, it is a combination reaction.

46. **(d)** $AgNO_3$

Explanation: Copper replaces Silver from silver nitrate as it is more reactive than Silver.
$2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2Ag$

47. **(b)** IV
Explanation:
$ZnSO_4$ solution is colourless. It is contained in IV.

48. **(b)** All of these
Explanation:
- When electricity is passed in water, it decomposes into hydrogen and oxygen. $2H_2O \rightarrow 2H_2 + O_2$
- Nitrogen is an unreactive gas it prevents oxidation, in turn, it prevents the rancidity of chips.
- Melting of ice is a physical change because it is a change in only the physical properties of the substance and it can be reversed, i.e, the substance formed can be restored back to their original form.
- Corrosion occurs in the presence of moisture. For example, when the iron is exposed to moist air, it reacts with oxygen to form rust.

So, all statements are correct.

49. **(d)** Double displacement
Explanation: Double displacement reactions are not redox reactions, as they do not involve a change in the oxidation number of either of the reactant.

50. **(a)** Combustion of Liquefied Petroleum Gas (LPG)
Explanation: Combustion of Liquefied Petroleum Gas (LPG) is not a physical change. It is a chemical change because the combustion of LPG produces new substances. A lot of heat is produced along with carbon dioxide and water vapor during this reaction. It is also irreversible in nature.
Rest three are physical changes as no new products are formed; the only state of the substance changes.

51. **(c)** Blue
Explanation: Copper sulfate is a sulfate salt of copper. It is a potent emetic and is used as an antidote for poisoning by phosphorus. It also can be used to prevent the growth of algae. The copper sulphate ($CuSO_4$) solution is blue in colour.

52. **(c)** $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$

Explanation: The number of atoms of all elements is equal on the reactants and products side.
So, $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$ is balanced chemical reaction.

53. **(a)** NO_2, O_2

Explanation: A decomposition reaction takes place on heating $Pb(NO_3)_2$ to form PbO, NO_2, and O_2.
Lead (II) nitrate $\rightarrow$ Lead (II) oxide + Nitrogen dioxide + Oxygen
$2\ Pb(NO_3)_2\ (s) \rightarrow 2\ PbO\ (s) + 4\ NO_2\ (g) + O_2\ (g)$

54. **(d)** Hydrated ferric oxide
Explanation: Rust is an iron oxide, a usually red oxide formed by the redox reaction of iron and oxygen in the presence of water or air moisture. Chemically, rust is a hydrated ferric oxide ($Fe_2O_3.\ H_2O$).

55. **(b)** It is a decomposition reaction and endothermic in nature.
Explanation: Potassium chlorate decomposes to give potassium chloride and oxygen. This is a decomposition reaction which is endothermic in nature.

56. **(c)** Assertion is CORRECT but, reason is INCORRECT.
Explanation: Assertion is CORRECT but, reason is INCORRECT.

57. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: Assertion and reason both are correct statements and reason is correct explanation for assertion.

58. **(a)** Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

59. **(c)** Assertion is correct statement but reason is wrong statement.
Explanation: Carbon dioxide reacts with lime water (calcium hydroxide) to form a milky precipitate of calcium carbonate.

60. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.
Explanation: A chemical reaction becomes faster at higher temperatures because at high temperature, the movement of particles are greater.