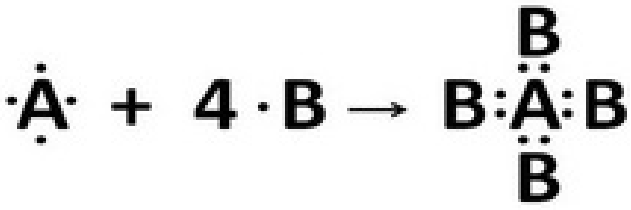
Page No 171:
Solution 67
(a) Covalent bond
(b) Low melting point
(c) No
(d) Yes
Solution 68
(i) Ionic bond
(ii) High melting point and boiling point
(iii) Yes
(iv) No
Solution 69
(a) Y and Z will form an ionic compound because an ionic bond is formed when one of the atoms can donate electrons to achieve the inert gas configuration, and the other atom needs electrons to achieve the inert gas configuration. Since Y has 7 and Z has 1 electron in their outermost shell, they would form an ionic bond.
(b) X and Y will react to form a covalent compound because a covalent bond is formed when both the reacting atoms need electrons to achieve the inert gas electron arrangement.
Solution 70
Covalent bond will be formed since covalent compounds are non conductors of electricity.



Solution 71
XY_2 has ionic bonds.
(i) XY_2 would conduct electricity when dissolved in water.
(ii) XY_2 would have high melting and boiling point.
Solution 72
AB_2 forms ionic bonds because an aqueous solution of an ionic compound conducts electricity because there are plenty of free ions in the solution which are able to conduct electric current.
Solution 73
(a) Covalent bond.
(b) Ionic bond .
Solution 74
(a) Ionic bond will be formed; element C donates its electron to element D.
(b) B is an inert gas; has complete octet configuration.
(c) C2A; element A needs two electrons to complete its octet.
Solution 75
XY_2 forms ionic bo nd. The electronic configuration of X changes from 2, 8, 2 to 2, 8, it donates its 2 electrons to two Y atoms. Hence, the elec tronic configuration of Y changes f rom 2, 8, 7 to 2, 8, 8 giving the compound XY_2.
Solution 76

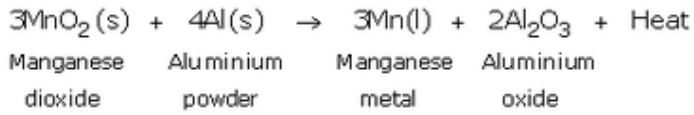
(a) A is a metal
(b) B and C are non-metals
(c) A and B combines to form an ionic bond.
(d) B and C combines to form a covalent bond.
(e) B will form an anion with valency 1 since it needs only 1 electron to complete its octet.
Solution 77
(i) B: Magnesium atom (At. no. = 12)
(ii) C: Oxygen atom (At. no. = 8)
(iii) D: Sodium ion (E.C = 2, 8)
(iv) A: Chloride ion (E.C = 2, 8, 8)
Page No 172:
Solution 78
(a) An atom of X loses 2 electrons to attain the nearest gas electron configuration (2,8).
(b) Neon
Solution 79
(a) A n atom of Y a ccepts 2 electrons to achieve the nearest inert gas electron arrangement (2, 8, 8).
(b) Argon
Solution 80
Solid air-fresheners are covalent compounds because they are volatile compounds with low melting and boiling points.
Solution 81
Formula of chloride of element X is XCl
Formula of chloride of element Y is YCl_4
The properties of two chlorides will be different because XCl is an ionic chloride whereas YCl_4 is a covalent chloride.

Page No 191:

Solution 1
Calamine, $ZnCO_3$
Solution 2
Reduction .
Solution 3
Rusting of iron can be prevented:
(i) By painting.
(ii) By applying grease or oil.
Solution 4
The process of depositing a thin layer of zinc metal on iron objects is called galvanisation; It prevents iron from rusting.
Solution 5
Zinc is used for galvanising iron.
Solution 6
Zinc is a quite reactive metal. The action of air on zinc metal forms a very thin coating of zinc oxide all over it, which is hard and impervious to air and hence prevents the further corrosion of zinc metal as well as the iron below it.
Solution 7
Iron objects are painted so that air and moisture can not come in contact with the iron objects and hence no rusting takes place.
Solution 8
Carbonate and sulphide ores are usually converted into oxides because it is easier to obtain metals from their oxides (by reduction) than from carbonates or sulphides.
Solution 9
Aluminium powder is used as the reducing agent for the extraction of manganese from its oxide.
Solution 10
Solder is an alloy of lead and tin.
Solution 11
Solder is an alloy of lead (Pb) and tin (Sn). It contains both the elements in 50-50 ratio. It has a low melting point and is used for soldering electrical wires together.

Solution 12
An alloy of mercury metal with one or more other metals is known as an amalgam.
Solution 13
Pure gold is said to be of 24 carats. It is not suitable for making ornaments because it is very soft.
Solution 14
Electrolytic refining.
Solution 15
(i) Presence of air (oxygen).
(ii) Presence of water (or moisture).
Solution 16
Rusting of iron can be prevented by alloying iron with chromium and nickel to make stainless steel.
Solution 17
Steel - Iron and carbon.
Stainless steel - Iron, chromium and nickel.
Solution 18
Silver, gold and platinum are used to make jewellery b ecause all of these metals have a bright shiny surface and are resistant to corrosion.
Solution 19
Silver metal becomes black in the presence of hydrogen sulphide gas in air .
Solution 20
Hydrogen sulphide gas tarnishes silver articles .
Solution 21
The silver articles combine slowly with the hydrogen sulphide gas present in air to form a black coating of silver sulphide. The tarnishing of the silver objects is due to this silver sulphide coating on the object's surface.
Solution 22
Bronze is an alloy of copper and tin; 90% copper and 10% tin. It is used for making statues and coins.
Solution 23
A new aluminium vessel lose shine so soon after use due to the corrosion of aluminium metal when exposed to moist air. This happens because the oxygen of air reacts with aluminium to form a thin, dull layer of aluminium oxide all over the vessel.
Solution 24
Gold ornaments look new even after several years of use because gold does not corrode when exposed to atmosphere. It is a highly unreactive metal which remains unaffected by air, water vapour and other gases in the atmosphere.
Solution 25
Gold and platinum are highly resistant to corrosion.
Solution 26
Low melting point of solder makes it sutaible for welding electrical wires .
Solution 27
Carbon cannot reduce oxides of sodium or magnesium because carbon is less reactive than magnesium or sodium. Carbon, which is a non-metal, is more reactive than zinc and can be placed just above Zn in the reactivity series. Hence, carbon can reduce the oxides of zinc and all other metals below zinc to form metals.
Solution 28
The metals like Na, K, Ca and Mg never found in their free state in nature because of the reason that all of these metals are high-up in the reactivity series. And just because they are so reactive, they are never found in nature as free elements.
Solution 29
(a) Zinc
(b) Sodium
(c) Manganese
(d) Mercury

Solution 30
(a) rusting
(b) air; water
(c) galvanisation
(d) tin; chromium
(e) green
(j) zinc
(g) tin
(h) carbon
(i) amalgam
(j) less
(k) gangue
Page No 192:
Solution 31
Manganese metal is extracted by the reduction of its oxide with aluminium powder as the reducing agent. Thus, when manganese dioxide is heated with aluminium powder, then manganese metal is formed.



Solution 32
The reduction of a metal oxide to form metal by using aluminium powder as a reducing agent is called a thermite reaction.
This property of reduction by aluminium is made use of in thermite welding for joining the broken pieces of heavy iron objects like girders etc.
A mixture of Iron (III) oxide and aluminium powder is ignited with a burning magnesium ribbon. Aluminium reduces iron oxide to produce iron metal with the evolution of a lot of heat. Due to this heat, iron metal is produced in the molten state. This molten iron is then poured between the broken iron pieces to weld them (to join them).

Solution 33
Electrolytic reduction: Aluminium and Sodium;
Reduction with carbon : Zinc, Iron and Tin;
Reduction with aluminium: Manganese
Solution 34
(a) Copper does not corrode easily in the presence of water but steel rusts in the presence of water.
(b) The surface of some metals acquires a dull appearance when exposed to air b ecause of the formation of an oxide layer on the surface of the metal.
Solution 35
(a) Aluminium does not corrode right through because aluminium is more reactive than iron and it forms a layer of aluminium oxide as soon as it comes in contact with moist air. This aluminium oxide layer is very tough and prevents the aluminium underneath from corroding.
(b) The process of thickening of aluminium oxide layer on the surface of aluminium objects by electrolysis is called anodizing. It is done to provide more protection to the aluminium object from corrosion.
Solution 36
(a) An iron grill is painted frequently to prevent its rusting .
(b) There is less corrosion of aluminium than iron when both are exposed to air because aluminium forms a layer of aluminium oxide on its surface as soon as it comes in contact with moist air. This aluminium oxide is very tough and prevents it from corroding right through.
Solution 37

(a) Electrolytic reduction .
(b) Copper glance (Cu 2 S)
(c) When calamine ore is heated strongly in the absence of air i.e. calcined, it decomposes to form zinc oxide and carbon dioxide.

$$\underset{\text{Zinc carbonate (Calamine ore)}}{ZnCO_3(s)} \xrightarrow{\text{Calcination}} \underset{\text{Zinc oxide}}{ZnO(s)} + \underset{\text{Carbon dioxide}}{CO_2(g)}$$

Then, zinc oxide is heated with carbon and zinc metal is produced.

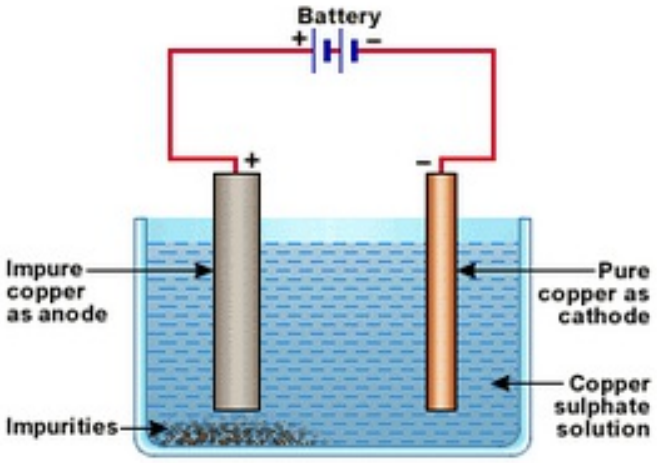
$$\underset{\text{Zinc oxide}}{ZnO(s)} + \underset{\text{Carbon}}{C(s)} \rightarrow \underset{\text{Zinc metal}}{Zn(s)} + \underset{\text{Carbon monoxide}}{CO(g)}$$

Solution 38
(a) Copper and Silver occur in nature in free state as well as in combined state.
(b) Pyrolusite; Manganese dioxide; MnO_2
(c)
(i) Roasting: When zinc sulphide (zinc blende ore) is strongly heated in air (roasted), it forms zinc oxide and sulphur dioxide.
(ii) Reduction: Zinc oxide obtained is heated with carbon to form zinc metal.
Solution 39
Different methods are used for extracting metals belonging to category of highly reactive metals, moderately reactive metals and less reactive metals. This is because the extraction of a metal from its concentrated ore is essentially a process of reduction of the metal compound present in the ore. For example: Manganese metal is obtained by the reduction of its oxide with aluminium powder and not carbon. This is because carbon is less reactive than manganese. Carbon, which is a non-metal, is more reactive than zinc and it can be placed just above Zn in the reactivity series. Hence, carbon can reduce the oxides of zinc and all other metals below zinc to form metals
Solution 40
The highly reactive metals are extracted by the electrolytic reduction of their molten chlorides or oxides.
Example: Sodium metal is extracted by the electrolytic reduction of molten sodium chloride. When electric current is passed through molten sodium chloride, it decomposes to form sodium metal and chlorine gas.

$$2NaCl(l) \xrightarrow{\text{Electrolysis}} 2Na(s) + Cl_2(g)$$

Solution 41
The moderately reactive metals are extracted by the reduction of their oxides with carbon, aluminium, sodium or calcium.
Example: When zinc sulphide (zinc blende ore) is strongly heated in air (roasted), it forms zinc oxide and sulphur dioxide. This process is called roasting. Then, zinc oxide is heated with carbon to form zinc metal. This process is termed as reduction.
Solution 42
The less reactive metals are extracted by the reduction of their oxides by heat alone.
Example: Mercury (II) sulphide ore is roasted in air when mercury (II) oxide is formed. When this mercury (II) oxide is heated to about 300^oC, it decomposes to form mercury metal.
Solution 43
The process of purifying impure metals is called refining of metals. Electrolytic refining is the most widely used method for the refining of impure metals obtained by various reduction processes.
In an electrolytic tank, acidified copper sulphate ($CuSO_4$ + dil ute H_2O_4) solution forms the electrolyte. A block of impure copper is made into an anode by connecting the positive terminal of a power

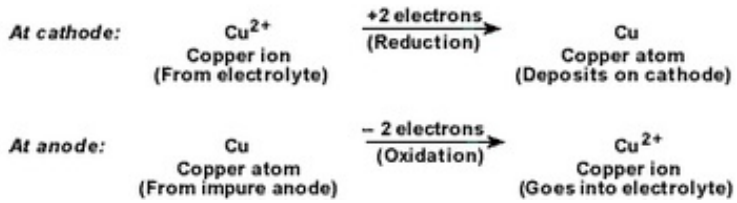
supply (battery). A thin strip of highly pure copper metal is the cathode of the cell. The negative terminal of the power supply is connected to it.



Experimental set up for the electrolytic refining of copper.

A small electric curr ent is passed through the cell. Atoms from the anode enter the electrolyte. The copper from the anode gets converted into copper sulphide. An equal number of copper atoms from the solution get deposited on the cathode. This is to keep the concentration of the solution constant. Impurities from the anode block either remain in solution or collect below the anode, as they are unable to displace copper from the sulphate solution. The insoluble impurities remain in the electrolyte and are called anode mud.

Copper sulphate solution contains ions of Cu^{++} and SO_4^{--}. The following reactions take place at the anode and cathode when an electric current is passed.



Pure copper is scraped or removed from the cathode. Anode becomes thinner as the electrolysis process proceeds. Some important metals like gold and silver are present in the anode mud. These can be recovered separately.

Solution 44

(a) (i) Minerals - The natural materials in which the metals or their compounds are found in earth are called minerals.

(ii) Ores - Those minerals from which the metals can be extracted conveniently and profitably are called ores.

(iii) Gangue - The unwanted impurities like sand, rocky material, earthy particles etc., present in an ore are called gangue.

(b) Before extracting metal from an ore, it is necessary to remove these impurities (gangue) from it. By removing the gangue, we get a concentrated ore containing a much higher percentage of metal. This is called concentration of ore; also known as enrichment of ore.

(c) Ore: Copper glance; Copper (I) sulphide, Cu_2S.

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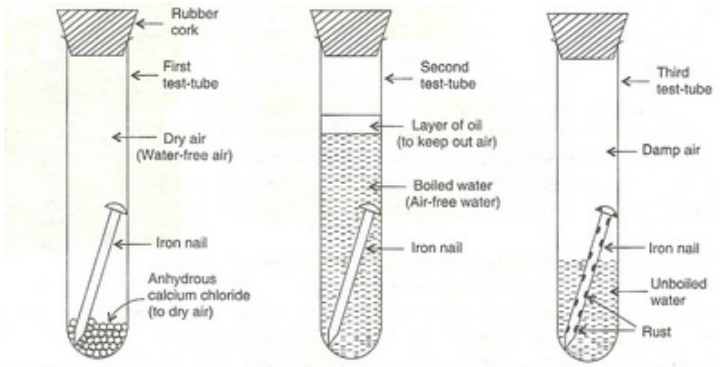
Solution 45

A mixture of Iron (III) oxide and aluminium powder is ignited with a burning magnesium ribbon. Aluminium reduces iron oxide to produce iron metal with the evolution of lot of heat. Due to this heat, iron metal is produced in the molten state. This molten iron is poured between broken iron parts of the machine to weld them (to join them).

$$Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) + Al_2O_3(s) + Heat$$

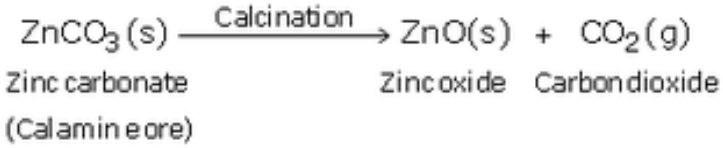
Solution 46
(a) The eating up of metals by the action of air, moisture or a chemical (such as an acid) on their surface is called corrosion.
(b) Gold and Platinum
(c) Rusting
(d) Aluminium begins to corrode quickly when it comes in contact with moist air. The action of moist air on aluminium metal forms a thin layer of aluminium oxide all over the metal. This aluminium oxide is very tough and prevents the metal underneath from further corrosion. Therefore, aluminium is used for making utensils irrespective of its highly reactive property as its corrosion leads to the non-corrosion of the metal in the longer run.
Solution 47
When an iron object is left in damp air (or water) for a considerable time, it gets covered with a red-brown flaky substance called rust. This is called rusting of iron.
Experiment to show that rusting of Iron requires both, air and water:
We take three test-tubes and put one clean iron nail in each of the three test-tubes:



a) Only air : No rusting (*b*) Only water : No rusting (*c*) Air and water together : Rusting takes place

1. In the first test-tube containing iron nail, we put some anhydrous calcium chloride and close its mouth with a tight cork. Anhydrous calcium chloride absorbs water moisture from the damp air present in the test-tube and make it dry. In this way, the iron nail in the first test-tube is kept in dry air (having no water vapour in it).
2. In the second test-tube containing iron nail , we put boiled distilled water. Boiled water does not contain any dissolved air (or oxygen) in it (this is because the process of boiling removes all the dissolved air from it). A layer of oil is put over boiled water in the test-tub e to prevent the outside air from mixing with boiled water. In this way, the iron nail in the second test-tube is kept in air free boiled water.
3. In the third test-tube containing an iron nail, we put unboiled wa ter so that about two-thirds of nail is immersed in water and the rest is a bove the water, exposed to damp air. In this way , the iron nail in the third test-tube has been placed in air and water together. The mouth of all three test tube s is closed with a cork and it is kept aside for about one week. After one week, we observe the iron nails kept in all the three test-tubes, one by one. We find that
(i) No rust is seen on the surface of iron nai l kept in dry air (water-f ree air) in the first test-tube. This tells us that rusting of iron does not take place in air alone.
(ii) No rust is seen on the surface of iron nail kept in air-free, boiled water in the second test-tube. This tells us that rusting of iron does not take place in water alone.
(iii) Red-brown rust is seen on the surface of iron nail kept in the presence of both air and wat er together the third test-tube. This tells us that rusting of iron takes pla ce in the presence of both air and water together.

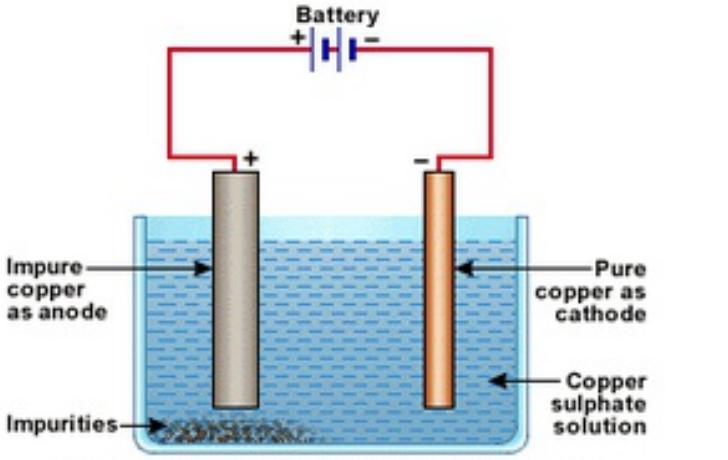
Solution 48
(a) An alloy is a homogeneous mixture of two or more metals (or a metal and small amount of non-metals). An alloy is prepared by mixing the various metals in molten state in required proportions, and then cooling their mixture to the room temperature.
(b) Steel contains iron and carbon. This alloy of iron (steel) is hard and strong. It also rusts less readily than pure iron.
(c) Brass contains copper and zinc. Brass is used for making cooking utensils.
Solution 49
(a) Aluminium and Zinc resist corrosion due to the formation of a thin, hard and impervious layer of oxide on their surface.
(b) (i) Painting (ii) Applying grease or oil (iii) Galvanisation (iv) Tin and chromium plating (v) Alloying to form stainless steel.
(c) Stainless steel contains i ron, chromium and nickel. Stainless steel does not rust at all and is strong and tough.
Solution 50
(a) Brass:It contains Copper (Cu)-80% and Zinc(Zn) - 20%. It is used for making cooking utensils.
(b) When a copper object remains in damp air for a considerable time, then copper reacts slowly with the carbon dioxide and water of air to form a green coating of basic copper carbonate on the surface of the object. The formation of this green coating of basic copper carbonate corrodes it. This process is known as corrosion of copper.
Solution 51
(a) When a coat of paint is applied to the surface of an iron object, it prevents air and moisture to come in contact with the object; hence no rusting takes place.
(b) The electrical conductivity of copper alloys like brass and bronze is less than that of pure copper.
(c) It means that 22 parts pure gold is alloyed with 2 parts of either silver or copper for making ornaments; Silver and copper are usually alloyed with gold to make it harder .
Solution 52
(a) When zinc carbonate is heated strongly in the absence of air, it decomposes to form zinc oxide and carbon dioxide.



(b) When copper (I) oxide reacts with copper (I) sulphide, it forms copper metal and sulphur dioxide.

Solution 53
(a) Aluminium can be used a reducing agent other than carbon.
(b) We cannot use an aqueous solution of sodium chloride to obtain sodium metal because if we electrolyse an aqueous solution of sodium chloride, then as soon as sodium metal is produced at cathode, it will react with water present in the aqueous solution to form sodium hydroxide. Hence, electrolysis of an aqueous solution of sodium chloride will produce sodium hydroxide and not sodium metal.
Solution 54
For the refining of an impure metal by the process of electrolysis, a thick block of impure metal is made anode (connected to +ve terminal of the battery) and a thin strip of the pure metal is made cathode (connected to -ve terminal of battery). A water soluble salt (of the metal to be refined) is taken as electrolyte. On passing current, impure metal dissolves from the anode and goes into the electrolyte solution. And pure metal from the electrolyte deposits on the cathode.
Electrolytic refining of copper: In an electrolytic tank, acidified

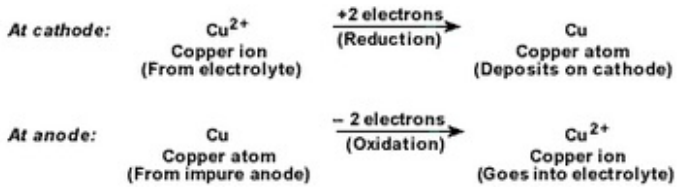
copper sulphate (CuSO 4 + dil ute H 2 O 4) solution forms the electrolyte. A block of impure copper is made into an anode by connecting the positive terminal of a power supply (battery). A thin strip of highly pure copper metal is the cathode of the cell. The negative terminal of the power supply is connected to it.



Experimental set up for the electrolytic refining of copper.

A small electric curr ent is passed through the cell. Atoms from the anode enter the electrolyte. The copper from the anode gets converted into copper sulphide. An equal number of copper atoms from the solution get deposited on the cathode. This is to keep the concentration of the solution constant. Impurities from the anode block either remain in solution or collect below the anode, as they are unable to displace copper form the sulphate solution. The insoluble impurities remain in the electrolyte and are called anode mud.

Copper sulphate solution contains ions of Cu^{++} and SO_4^{--}. The following reactions take place at the anode and cathode when an electric current is passed.



Pure copper is scraped or removed from the cathode. Anode becomes thinner as the electrolysis process proceeds. Some important metals like gold and silver are present in the anode mud. These can be recovered separately.

Solution 55

(a) Aluminium oxide is electrolysed in molten state to obtain aluminium metal. Oxygen gas is evolved during the process.

(b) Sodium chloride is electrolysed in molten state to obtain sodium metal. Chlorine gas is evolved during this process.

(c) Carbon dioxide is produced when calamine ore is calcined.

(d) Sulphur dioxide gas is evolved when cinnabar ore is roasted.

Solution 56

(a) Gold and Platinum are found in nature mainly in the free state.

(b) Sodium and Magnesium are always found in combined state.

(c) Iron (III) oxide; Fe_2O_3 is present in haematite ore.

Solution 57

(a) The natural materials in which the metals or their compounds are found in earth are called minerals. Those minerals from which the metals can be extracted conveniently and profitably are called ores.

(b) Mercury.

(c) Rock salt - Sodium chloride, NaCl.

(d) Sodium metal is extracted by the electrolytic reduction of molten sodium chloride. When electric current is passed through

molten sodium chloride, it decomposes to form sodium metal and chlorine gas.

$$2NaCl(l) \xrightarrow{\text{Electrolysis}} 2Na(s) + Cl_2(g)$$

(e) Potassium, Calcium and Magnesium .
Solution 58
(a) Iron is extracted from haematite ore .
(b) Bauxite; Aluminium oxide, $Al_2O_3.2H_2O$
(c) Aluminium metal is extracted by the electrolytic reduction (electrolysis) of molten aluminium oxide. When electric current is passed through molten aluminium oxide, it decomposes to form aluminium metal and oxygen gas.

$$2Al_2O_3(l) \xrightarrow{\text{Electrolysis}} 4Al(s) + 3O_2(g)$$

(d) A luminium metal is produced at Cathode (Negative electrode).
(e) Oxygen gas is produced; at anode (Positive electrode).
Page No 194:
Solution 59
(a) Aluminium.
(b) Haematite; Iron (III) oxide, Fe_2O_3
(c) Zinc sulphide (zinc blende ore) is strongly heated in air (roasted), it forms zinc oxide and sulphur dioxide. This process is called roasting.

$$2ZnS(s) + 3O_2(g) \xrightarrow{\text{Roasting}} 2ZnO(s) + 2SO_2(g)$$

Then, zinc oxide is heated with carbon to form zinc metal. This process is termed as reduction.

$$ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$$

(d) The galvanized iron object remains protected against rusting even if a break occurs in the zinc layer because zinc is more easily oxidised than iron. Hence, the zinc continues to corrode but iron object does not corrode or rust.
(e) Aluminium .
Solution 60
(a) Sodium.
(b) (i) Calamine; Zinc carbonate, $ZnCO_3$
(ii) Zinc blende; Zinc sulphide, ZnS
(c) Mercury (II) sulphide ore is roasted in air when mercury (II) oxide is formed.

$$\underset{\text{Mercury (II) Sulphide}}{2HgS(s)} + \underset{\text{Oxygen}}{3O_2(g)} \xrightarrow{\text{Roasting}} \underset{\text{Mercury (II) Oxide}}{2HgO(s)} + \underset{\text{Sulphur dioxide}}{2SO_2(g)}$$

When this mercury (II) oxide is heated to about 300°C, it decomposes to form mercury metal.

$$\underset{\text{Mercury (II) Oxide}}{2HgO(s)} \xrightarrow[\text{Reduction}]{\text{Heat}} \underset{\text{Mercury metal}}{2Hg(l)} + \underset{\text{Oxygen}}{O_2(g)}$$

(d) Anode - Thick block of i mpure metal M
Cathode - Thin strip of p ure metal M
Electrolyte - Water soluble salt (of metal M).
(e) (i) Copper
(ii) Zinc
(iii) Nickel
(iv) Gold
(v) Silver
Solution 61
(a) Zinc
(b) Cinnabar; Mercury (II) sulphide, HgS
(c) The concentrated copper (I) sulphide ore (copper glance), Cu_2S is roasted in air when a part of copper (I) sulphide is oxidised to copper (I) oxide.

$$2Cu_2S(s) + 3O_2(g) \xrightarrow{\text{Roasting}} 2Cu_2O(s) + 2SO_2(g)$$

When a good amount of copper (I) sulphide has been converted to

copper (I) oxide, then the supply of air for roasting is stopped. In the absence of air, copper (I) oxide formed above reacts with remaining copper (I) sulphide to form copper metal and sulphur dioxide.

$$2Cu_2O(s) + Cu_2S(s) \xrightarrow{\text{Heat}} 6Cu(s) + SO_2(g)$$

(d) An alloy is a homogeneous mixture of two or more metals (or a metal and small amounts of non-metals).
Steel and Brass are examples of alloys.
(e) (i) Alloys are stronger than the metals from which they are made.
(ii) Alloys are harder than the constituent metals.
(iii) Alloys are more resistant to corrosion.
(iv) Alloys have lower melting points than constituent metals.
(v) Alloys have lower electrical conductivity than pure metals.

********** END **********