CHEMICAL REACTION AND EQUATIONS

MCQ

Q1.Why is it important to balance a skeletal chemical equation?
(a) To verify law of conservation of energy.
(b) To verify the law of constant proportion.
(c)To verify the law of conservation of mass.
(d)To verify the law of conservation of momentum.
Ans:- (c)To verify the law of conservation of mass.

Q2. What happens when dilute sulphuric acid is added to iron filling? **(1mark)**
(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.
Ans:- (a)Hydrogen gas and iron chloride are produced.

Q3 From the following, which one is an example of a chemical reaction?
(a) Grapes get fermented (b) Breakdown of food (c) Formation of curd (d) All of the above
Answer: Option (d)

Q4) A student performs an experiment to form aluminium chloride from aluminium and chlorine. Which of the following option gives the chemical equation of the reaction?
(a) $Al + Cl_2 \rightarrow AlCl_2$ (b) $2Al + Cl_2 \rightarrow 2AlCl$
(c) $2Al + 3Cl_2 \rightarrow 2AlCl_3$ (d) $3Al + 3Cl_2 \rightarrow 3AlCl_3$
Answer: Option (c)

Q5. Give the ratio in which hydrogen and oxygen are present in water by volume.
(a) 1:2 (b) 1:1 (c) 2:1 (d) 1:8
Answer: Option (c)

Q6) A researcher adds barium hydroxide to hydrochloric acid to form a white-coloured barium chloride. Which of the following option gives the balanced chemical equation of the reaction?
(a) $HCl + Ba(OH)_2 \rightarrow BaCl_2 + 2H_2O$ (b) $2HCl + Ba(OH)_2 \rightarrow BaCl_2 + 2H_2O$
(c) $2HCl + Ba(OH)_2 \rightarrow BaH_2 + 2HCl + O_2$ (d) $HCl + 2Ba(OH)_2 \rightarrow 2BaCl_2 + 2H_2O + O_2$
Answer: Option (b)

Q7. One of the following processes does not involve a chemical reaction, that is:
(a) Melting of candle wax when heated (b) Burning of candle wax when heated
(c) Digestion of food in your stomach (d) Ripening of banana
Answer: Option (a)

Q8) A student wrote a chemical equation of the reaction between carbon monoxide and hydrogen as,
$CO + 2H_2 \rightarrow CH_3OH$.

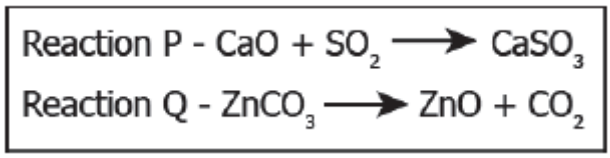
How can the reaction be classified?
(a) The reaction is an example of a combination reaction as a compound separates into two compounds.
(b) The reaction is an example of a decomposition reaction as a compound dissociates into two compounds.

(c) The reaction is an example of a combination reaction as two compounds react to form a single compound.
(d) The reaction is an example of a decomposition reaction as two compounds react to form a single compound.
Answer: Option (c)

Q9) The chemical formula of magnesium oxide is _____.

(a) MgO_2 (b) Mg_2O (c) MgO (d) $Mg(OH)_2$
Answer: Option (c)

Q10) A student learns that some products are formed as a result of combining two compounds while some compounds are formed as a result of the dissociation of two compounds. The image shows two reactions.



Which reaction is an example of a combination reaction and a decomposition reaction?

(a) Both reactions are examples of combination reaction
(b) Both reactions are examples of a decomposition reaction
(c) Reaction P is an example of a combination reaction, while reaction Q is an example of a decomposition reaction
(d) Reaction P is an example of a decomposition reaction, while reaction Q is an example of a combination reaction
Answer: Option (c)

Q11. $PCl_5(s) + X\ H_2O(l) \rightarrow Y\ H_3PO_4(aq) + Z\ HCl(aq)$.
The value of X, Y and Z are:
(a) X-4, Y-3, Z-3 (b) X-4, Y-1, Z-5
(c) X-1, Y-2, Z-3 (d) X-5, Y-1, Z-2
Answer:-Option (b)

Q12. The balancing of chemical equation is based on:
a) Law of conservation of energy b) Law of conservation of mass
c) Law of conservation of heat d) None of these
Answer:- (b)

Q13. Which one of the following is the example of precipitation reaction?
a) $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
b) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
c) $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$
d) $CuCO_3(s) + Heat \rightarrow CuO(s) + CO_2(g)$
Answer:-Option (c)

Q14. A solution of substance X is used for white washing. Here X is:
a) CaO b) CaO_2
c) NaCl d) KCl
Answer:- Option (a)

Q15. Identify the substances that is oxidized and the substance that is reduced in the following reactions:
$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$

a) H_2,CuO b) H_2,H_2O

c) H_2,Cu d) Cu,H_2

Answer:- Option (a)

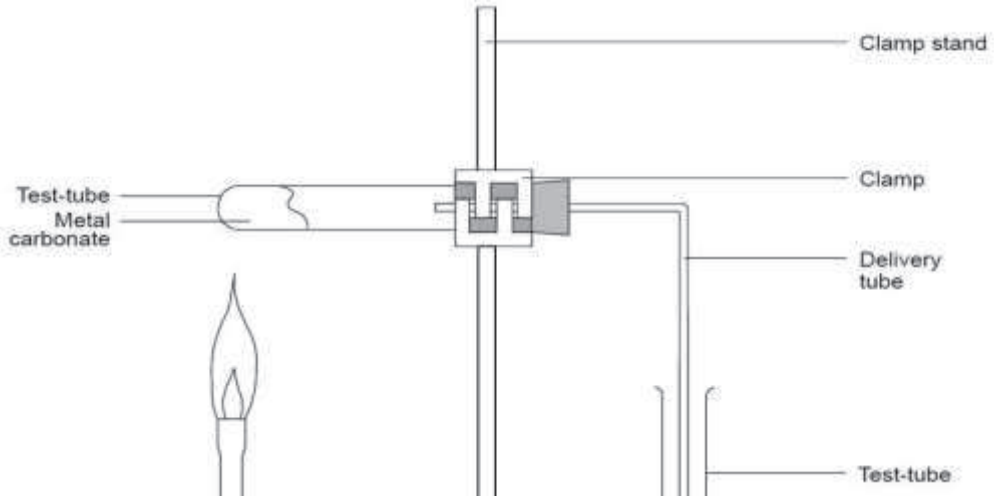
Q16. A shiny brown coloured element X on heating in air becomes black in colour. Here X is:

a) Copper b) Silver

c) Aluminium d) Mercury

Answer:- Option (a)

Q17. The given diagram represents a .....reaction.



a) Thermal decomposition b) Displacement

c) Double displacement d) Combination

Answer:- a) Thermal decomposition

Q18. Prajakta left the silver chloride in a bowl near the window in the sunlight as shown in the figure:

The colour of silver chloride after sometime is:

(a) Black (b) Green

(c) Grey (d) Yellow

Answer:-

Answer:- Option (c)

Q19. One day Dona was performing an experiment in the laboratory. By mistake she leaves the iron nail in the copper sulphate solution for one week. After one week, the colour of sulphate solution is:

a)Green b) Yellow

c) Red d) Colourless

Answer:-

Answer:- Option (a)

Q20. Eshani takes about 2g ferrous sulphate crystals in dry boiling tube and heated the boiling tube over the flame of a burner or spirit lamp. The colour of crystals after heating is:

(a) Black (b) Brown

(c) Green (d) Orange

Answer:- Option (b)

Very Short Answer type (2marks)

Q1.Write the balanced chemical equations for the following chemical reaction:-

(i)Hydrogen sulphide gas burns in air to give water and sulphur dioxide

(ii)During respiration glucose combines with oxygen and produces carbon dioxide with release of energy.

Ans- (i) $2H_2S + 3O_2 \xrightarrow{} 2H_2O + 2SO_2$

(ii)Glucose combines with oxygen present in the cells of our bodyto provide energy.In the process of respiration ,glucose reacts with oxygen in the cellof our body to provide carbon di oxide and water .Large amount of energy are released during this process .Respiration is an eexothermic process .

Q2.Which among the following are physical or chemical changes?

(2marks)

(a) Evaporation of petrol

(b) Burning of Liquefied Petroleum Gas (LPG)

(c) Heating of an iron rod to red hot.

(d) Sublimation of solid ammonium chloride

Ans -a) Physical b)Chemical

c)Physical d)Physical

Q3.Why do we store silver chloride in dark coloured bottles?

(2marks)

Ans- Compounds like Silver Chloride are light sensitive. And they may react to light very fast and lose its properties. That's why they are to be stored in dark bottles to prevent the entry of light.

Q4. What is a redox reaction? When a magnesium ribbon burns in air with a dazzling flame and forms a white ash, is magnesium oxidized or reduced? Why?

(2marks)

Ans- Those reactions, in which oxidation and reduction reactions occur simultaneously, are called redox reactions. In these reactions one substance is oxidised and another substance gets reduced.

When a magnesium ribbon burns to form a white ash, magnesium metal is oxidised in this reaction because it combined with oxygen to form magnesium oxide.

$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ We can see that the Oxidation state of Mg changes from 0 in free state to +2 in its oxide. Hence we can say that Mg has been oxidized. SImilarly the Oxidation state of O changes from 0 to -2, getting reduced in the process. Since both oxidation and reduction occurs simultaneously, this is an example of Redox reaction.

Q5.Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(2marks)

(a) Thermite reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.

(b) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

Ans-a) $2Al(s)+Fe_2O_3(s) \rightarrow Al_2O_3(s)+2Fe(l)+heat$, displacement reaction

b)$2KI(aq)+Cl_2(g) \rightarrow 2KCl(aq)+I_2(s)$, displacement reaction.

Q6.Identify the reducing agent in the following reactions

(2marks)

(a) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$ (b) $H_2O + F_2 \rightarrow HF + HOF$

(c) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ (d) $2H_2 + O_2 \rightarrow 2H_2O$

Ans- (a) NH_3 acts as reducing agent. (b) F_2

(c) CO (d) $2H_2$

Q7. Complete the missing components/variables given as x and y in the following reactions . **(2marks)**

(a) $Pb(NO_3)_2\ (aq) + 2KI(aq) - \rightarrow PbI_2(x) + 2KNO_3(y)$

(b) $Cu(s) + 2AgNO_3(aq) - \rightarrow Cu(NO_3)_2(aq) + x(s)$

(c) $Zn(s) + H_2SO_4(aq) - \rightarrow ZnSO_4(x) + H_2(y)$

(d) $CaCO_3(s) - - x\rightarrow CaO(s) + CO_2(g)$

Ans-a)x-s, y-aq b)x is Ag

c)x-aq , y-g d)x is heat

Q8.A solution of a substance X is used for whitewashing.

(i) Name the substance X and write its formula.

(ii) Write the reaction of the substance X named in above with water**.** **(2marks**)

Ans-i) Calcium oxide, CaO.

ii) $CaO+H_2O\rightarrow Ca(OH)_2$+heat

Q9.A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.

(a) Write the chemical formulae of X and Y.

(b) Write a balanced chemical equation, when X is dissolved in water**.** **(2marks)**

Ans-a)Compound X is MgO and Y is Mg_3N_2

b)$2Mg+O_2\rightarrow 2MgO,\ 3Mg+N_2\rightarrow Mg_3N_2$

Q10. $X+YSO_4$— XSO_4+Y

$Y+XSO_4$—-- No reaction

In above equation out of the two elements X and Y which is more reactive and why? **(2marks**)

Ans-As X can easily lose electrons as compared to Y and result in the formation of from , thus X is more reactive than Y. As Y is not able to displace X from its salt solution, it is less reactive than X. Thus the answer is X is more reactive than Y.

Long Answer Type (5marks)

Q1. (a) Define a balanced chemical equation. Why should an equation be balanced?

(b) Write the balanced chemical equation for the following reaction:

(i) Phosphorus burns in presence of chlorine to form phosphorus penta chloride.

(ii) Burning of natural gas.

(iii) The process of respiration.

Answer. (a) Balanced chemical equation has an equal number of atoms of different elements in the reactants and products. According to law of conservation of mass, matter can neither be created nor be destroyed in a chemical reaction.

(b)(i) $P_4\ (s) + 10Cl_2\ (g)$ ———> $4PCl_5\ (S)$

(ii)$CH_4\ (g) + 2O_2\ (g)$ ———> $CO_2\ (g) + 2H_2O(l)$ + heat energy

(iii) $C_6H_{12}O_6\ (s) + 6O_2\ (g) + 6H_2O$ ———> $6CO_2\ (aq) + 12H_2O\ (l)$ + energy

Q2.State the type of chemical reactions, represented by the following equations : 5

(a) $A + BC \rightarrow AC + B$

(b) $A + B \rightarrow C$

(c) $PQ + RS \rightarrow PS + RQ$

(d) $A_2O_3 + 2B \rightarrow B_2O_3 + 2A$

(e) $2\ AB \rightarrow A_2 + B_2$

Ans-(a)Displacement reaction

(b)Combination reaction

(c)Double displacement reaction

(d)Redox reaction

(e)Decomposition reaction

Q3. Identify the type of chemical reaction in the following statement and define each of them:

a. Digestion of food in our body.

b. Rusting of iron.

c. Heating of manganese dioxide with aluminium powder.

d. Blue colour of copper sulphate solution disappears when iron filings are added to it.

e. Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water.

Ans:-

a. Decomposition reaction: It is a process in which a compound is broken down into simple substances.

b. Oxidation: The process in which oxygen is added or electrons are lost. Oxidation and Reduction are taking places simultaneously in rusting of iron

c. Displacement reaction: The reaction in which amore reactive element can displace a less reactive element from its salt solution.

d. Displacement reaction: The reaction in which amore reactive element can displace a less reactive element.

e. Neutralization reaction: The reaction in which acid reacts with base to form salt and water

ASSERTION-REASON (1marks)

Following questions consist of two statements – Assertion (A) and Reason (R).

Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

1. **Assertion(A) :** Decomposition of vegetable matter into compost is an example of exothermic reactions.

Reason (R) : Exothermic reaction are those reactions in which heat is evolved.

Answer(a)

2. **Assertion (A):** Iron articles are painted so as to prevent them from rusting. 1
Reason (R): When the surface of iron is coated with paint, its surface does not come in contact with oxygen and moisture therefore rusting does not take place.
Answer(a)

3. **Assertion (A):** Rusting of iron metal is the most common form of corrosion. 1
Reason (R): The effect of rusting of iron can be reversed if they are left open in sunlight.
Answer(C)

Q.4. Assertion (A) : When HCl is added to zinc granules, a chemical reaction occurs.
Reason (R) : Evolution of a gas and change in colour indicate that the chemical reaction is taking place.
Answer(b)

Q.5**Assertion (A):** Pungent smelling gas is produced when sulphur burns in air.
Reason (R) : Sulphur trioxide is formed on reaction of sulphur with oxygen.
Answer-C

Short Answer Type

Q1. What is the difference between displacement and double displacement reactions? Write equations for these reactions.
(3marks)

Ans-In a displacement reaction, only a single displacement takes place whereas in the double displacement reaction, as the name suggests two displacement takes place between the molecules.
Example:
Displacement reaction
$Mg + 2HCl \rightarrow MgCl_2 + H_2$
Double displacement reaction
$2KBr + BaI_2 \rightarrow 2KI + BaBr_2$

Q2. What happens when a piece of
(3marks)
(a) Zinc metal is added to copper sulphate solution?
(b) aluminium metal is added to dilute hydrochloric acid?
(c) Silver metal is added to copper sulphate solution?
Also, write the balanced chemical equation if the reaction occurs.

Ans-a) zinc being more active metal than copper it displces it to form zinc sulphate
$Zn(s)+CuSO_4(aq)$—---> $ZnSO_4(aq) + Cu(s)$

b) Aluminium metal dissolve in hydrochloric acid yelding aluminium chloride and colourless hydrogen gas.
$2Al(s)+6HCl$—>$3AlCl_3+3H_2$

c)There will be no reaction when silver reacts with copper sulphate solution as reactivity of silver is less than that of copper, as per the reactivity series.

Q3. What is meant by thermal decomposition reaction? Explain with an example. **(3marks)**
Ans-Those reactions which break up or decompose on heating to form many products.
Example - Zinc carbonate on heating decomposes to form Zinc oxide and carbon dioxide.

Q4.Identify the oxidising agent (oxidant) in the following reactions
(3marks)
(a) $Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$
(b) $2Mg + O_2 \longrightarrow 2MgO$
(c) $CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$
(d) $V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$
(e) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
(f) $CuO + H_2 \longrightarrow Cu + H_2O$
Ans-a)Pb_3O_4 b)O_2
c)$CuSO_4$ d)V_2O_5
e)$4H_2O$ f)CuO

Q5. Write the balanced chemical equations for the following reactions:-
(3marks)
(a) Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogen carbonate.
(b) Sodium hydrogen carbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
(c) Copper sulphate on treatment with potassium iodide precipitates cuprous iodide ($Cu_2 I_2$), liberates iodine gas and also forms potassium sulphate.

Ans
(a)$Na_2CO_3 + HCl \rightarrow NaCl + H_2O + CO_2$
(b) $HCl + NaHCO_3 \longrightarrow NaCl + CO_2 + H_2O$.
(c)$4KI + 2CuSO_4 \rightarrow Cu_2I_2 + I_2 + K_2SO_4$

Q6.Balance the following chemical equations and identify the type of chemical reaction**.**
(3marks)
(a) $Mg(s) + Cl_2(g) \longrightarrow MgCl_2(s)$
(b) $HgO(s)\ Heat \longrightarrow Hg(l) + O_2(g)$
(c) $Na(s) + S(s) \longrightarrow Na_2S(s)$
(d) $TiCl_4(l) + Mg(s) \longrightarrow Ti(s) + MgCl_2(s)$
(e) $CaO(s) + SiO_2(s) \longrightarrow CaSiO_3(s)$
(f) $H_2O_2(l) + UV \longrightarrow H_2O(l) + O_2(g)$

Answer:
(a)$Mg(s) + Cl_2(g) \longrightarrow MgCl_2(s)$ (Combination Reaction)
(b) $2HgO(s)\ Heat \longrightarrow 2Hg(l) + O_2(g)$(Thermal Decomposition Reaction)
(c) $2Na(s) + S(s) \longrightarrow Na_2S(s)$ (Combination Reaction)
(d) $TiCl_4(l) + 2Mg(s) \longrightarrow Ti(s) + 2MgCl_2(s)$ (Displacement Reaction)
(e) $CaO(s) + SiO_2(s) \longrightarrow CaSiO_3(s)$ (Combination Reaction)
(f) $H_2O_2(l) + UV \longrightarrow H_2O(l) + O_2(g)$)(Decomposition Reaction)

Q7. 1 g of copper powder was taken in a China dish and heated. What change takes place on heating? When hydrogen gas is passed over this heated substance, a visible change is seen in it. Give the chemical equations of reactions, the name and the colour of the products formed in each case. **(3marks)**

Ans-When 1 g of copper powder is taken in a china dish and heated, a black-colored substance is formed, called copper oxide. The copper gets oxidized to copper oxide. CuO and copper metal is obtained when hydrogen gas is passed over this heated substance.

Q8.A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound 'B'.
(i) Identify A and B.
(ii) Write a chemical equation for the reaction of A with water.
(iii) List two types of reaction in which this reaction may be classified. **(3marks)**

Ans-(i)Compound 'A' is calcium oxide (CaO) and 'B' is calcium hydroxide ($Ca(OH)_2$).

(ii) $CaO+H_2O \rightarrow Ca(OH)_2+heat$

(iii) The two types of reaction involved when calcium oxide reacts with water are combination reaction and exothermic reaction.

$CaO+H_2O \rightarrow Ca(OH)_2+heat$

- A combination reaction is a reaction in which two or more reactants combine to form a single product.
- A reaction in which energy is released in the form of light or heat is known as an exothermic reaction.

Q9..Mention with reason the colour changes observe when:
(3marks)
(i) silver chloride is exposed to sunlight.
(ii) copper powder is strongly heated in the presence of oxygen.
(iii) a piece of zinc is dropped in copper sulphate solution

Ans-i)the white color silver chloride turns into grey-white color silver.
ii)It changes its colour from brown to black.
iii)form a colourless solution of zinc sulphate.

Q10.A substance X, which is an oxide of a group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved**.**
(3 marks)

Ans-Substance X is calcium oxide (CaO), also known as quicklime. It is an important ingredient in the processing of cement. Calcium oxide reacts with water to form calcium hydroxide $Ca(OH)_2$ which is a base and therefore, turns red litmus blue.

COMPETENCY BASED QUESTIONS (4marks)

Q1.A chemical reaction is a representation of chemical change in terms of symbols and formulae of reactants and products. There are various types of chemical reactions like combination, decomposition, displacement, double displacement, oxidation and reduction reactions.

Reactions in which heat is released along with the formation of products are called exothermic chemical reactions. All combustion reactions are exothermic reactions.

(i) The chemical reaction in which a single substance breaks down into two or more simpler substances upon heating is known as

(a) thermal decomposition reaction (b) photo decomposition reaction
(c) electric decomposition reaction (d) both (a) and ©

Answer: (a) The chemical reaction in which a single substance breaks down into two or more simpler substances upon heating is known as thermal decomposition reaction.

(ii) The massive force that pushes the rocket forward through space is generated due to the

(a) combination reaction (b) decomposition reaction
(c) displacement reaction (d) double displacement reaction

Answer: (b) The massive force that pushes the rocket forward through space is generated due to the decomposition reaction. Hydrogen peroxide decomposes and provides it with a considerable reaction force thrust

(iii) A white salt on heating decomposes to give brown fumes and yellow residue is left behind. The yellow residue left is of

(a) lead nitrate (b) nitrogen oxide (c) lead oxide(d) oxygen gas

Answer: (c) Lead nitrate decomposes to give brown fumes of nitrogen dioxide gas and yellow residue of lead oxide is left behind.

(iv) Which of the following reactions represents a combination reaction?

(a) $CaO\ (s) + H_2O\ (l) \rightarrow Ca(OH)_2\ (aq)$
(b) $CaCO_3\ (s) \rightarrow CaO\ (s) + CO_2(g)$
(c) $Zn(s) + CuSO_4\ (aq) \rightarrow ZnSO_4\ (aq) + Cu(s)$
(d) $2FeSO_4(s) \rightarrow Fe_2O_3\ (s) + SO_2(g) + SO_3(g)$

Answer: (a) A reaction in which two or more reactants combine to form a single product is known as a combination reaction.

Q2. Oxidation is the process of gaining of oxygen, or losing of hydrogen. Reduction is the process of losing of oxygen or gaining of hydrogen. The substance which undergoes oxidation is the reducing agent while the substance which undergoes reduction is known as the oxidising agent. Oxidation and reduction always take place together and these type of reactions are known as redox reactions. Some o

I.	$Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$
II.	$2Mg + O_2 \longrightarrow 2MgO$
III.	$CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$
IV.	$V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$
V.	$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$
VI.	$CuO + H_2 \longrightarrow Cu + H_2O$

f

The examples of redox reactions are given below
:

(i) Give an example of oxidation reaction from your everyday life.

Answer: Corrosion and Rancidity

(ii) Write the oxidizing agent in the reaction III and VI.

Answer: $CuSO_4$ in (III) and CuO in (VI)

(iii) Which of the following is an oxidizing agent?

(a) $LiAlH_4$ (b) Alkaline $KMnO_4$ (c) Acidified $K_2Cr_2O_7$ (d) Both (b) and (c)

Answer: d

(iv) Out of oxidation and reduction, which reaction takes place at anode?

Answer: Oxidation takes place at anode.