1. Chemical Reactions and Equations

Periodic Test

1. Question

What causes rancidity? Name an antioxidant which prevents rancidity.

Answer

When fats and oils are left open, they get oxidized in the presence of air, their smell and taste change. This means the oxidation is the main cause for rancidity in fats and oil.

The substances which prevent oxidation of the food items are called antioxidants. Example, Nitrogen is an inert gas and does not oxidize the food. Thus, it is used as antioxidants by chips manufactures.

2. Question

Balance the equation: $S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$

Answer

<u>Balanced equation:</u> $S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$

Step 1: Write the unbalanced equation

$S + HNO_3 \rightarrow H_2SO_4 + NO_2 + H_2O$

Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
S	1	1
H	1	4
O	3	7
N	1	1

Step 3: Now, first let us consider nitrogen atom. If we multiply 6 in the reactant (HNO_3) and product (in NO_2), we will get the equal number of atoms.

No. of atoms of nitrogen	Reactant (in HNO_3)	Product (in NO_2)
Initially	1	1
To balance	1 × 6 = 6	1× 6 = 6

Step 4: Write the resulting equation:

$S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + H_2O$

Step 5: Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
S	1	1
H	6	4
O	18	17
N	6	6

We find that the equation is not balanced yet. As the number of hydrogen and oxygen atoms are unequal on the two sides.

first balance the oxygen atom.

Step 6: If we multiply 2 in the product (in H_2O) and 6, we will get the equal number of oxygen atoms on both sides.

No. of atoms of oxygen	Reactant (in HNO_3)	Product (in H_2SO_4 + + $6NO_2$ + H_2O)
Initially	18	17
To balance	18	4 + 12 + 2× 1 = 18

Step 7: Write the resulting equation:

$S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$

Step 8: Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
S	1	1
H	6	6
O	18	18
N	6	6

Step 9: Write the resulting equation:

$S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$

We find that the equation is balanced now.

Step 10: Write down the final balanced equation:

$S + 6HNO_3 \rightarrow H_2SO_4 + 6NO_2 + 2H_2O$

3. Question

In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode?

Answer

In the electrolysis of water, the gas collected at cathode is hydrogen and the gas collected at anode is oxygen. The gas which is collected in double amount is hydrogen. This is because water contains two molecules as compared to one molecule of oxygen.

The reaction that takes place in the formation of water from H_2 and O_2 is:

$2H_2 + O_2 \rightarrow 2H_2O$

4. Question

Why respiration and decomposition processes are considered to be an exothermic process?

Answer

Respiration and decomposition processes are exothermic process because:

i. We all get energy from the food we eat.

ii. During digestion, food is broken down into simpler substances.

iii. For example, Carbohydrates (rice, potatoes, bread) are broken down to form glucose.

iv. This glucose combines with oxygen and provides energy to the whole body.

5. Question

Identify the substance oxidised and reduced in the chemical reaction:

$2Mg + O_2 \rightarrow 2MgO$

Answer

O_2 is an oxidizing agent and Mg is reducing agent

$2Mg + O_2 \rightarrow 2MgO$

In the given reaction, O_2 is reduced by losing oxygen atoms. Thus, O_2 is an oxidizing agent as it undergoes reduction.

Mg is oxidized by gaining oxygen atoms. Thus, Mg is a reducing agent as it undergoes oxidation.

6. Question

Why potato chips manufacturers fill the packet of chips with nitrogen gas?

Answer

Potato chips manufacturers fill the packet of chips with nitrogen gas to prevent the chips from getting oxidized. If the oxidation takes place, the chips can become rancid and their smell and taste will change.

Hence, to prevent oxidation, the packet of chips are filled with nitrogen gas. Nitrogen gas is an antioxidant.

7. Question

Identify the type of reaction:

$Fe + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

Answer

The type of reaction is displacement reaction

In the given reaction:

$Fe + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

The iron metal being more reactive than copper displaces it, and forms a new compound that is $FeSO_4$

8. Question

Balance the given chemical equation:

$Al(s) + CuCl_2(aq) \rightarrow AlCl_3(aq) + Cu(s)$

Answer

Balanced equation: $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

Step 1: Write the unbalanced equation

$Al + CuCl_2 \rightarrow AlCl_3 + Cu$

Step 2: Compare the number of atoms of reactants with the number of atoms of products.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	1	1
Cu	1	1
Cl	2	3

Step 3: Now, first we consider the element having unequal no. of atoms on both sides. Thus, first let us consider the chlorine atom. If we multiply 3 in the reactant (in $CuCl_2$) and 2 in the product ($AlCl_3$), we will get the equal number of atoms in both sides.

No. of atoms of chlorine	Reactant (in $CuCl_2$)	Product (in $AlCl_3$)
Initially	2	3
To balance	$2 \times 3 = 6$	$3 \times 2 = 6$

Step 4: Write the resulting equation:

$Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$

Step 5: Now check whether the equation is balanced or not by comparing the atoms

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	1	2
Cu	3	1
Cl	6	6

We find that the equation is not balanced yet. As the number of Cu and Al atoms are unequal on the two sides. First balance the Al atom.

Step 6: If we multiply 2 in the reactant (in Al), we will get the equal number of Al atoms on both sides.

No. of atoms of Al	Reactant (in Al)	Product (in $2AlCl_3$)
Initially	1	2
To balance	1 × 2 = 2	2

Step 7: Write the resulting equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$

Step 8: Now check whether the equation is balanced or not by comparing the atoms.

	Reactants (left side)	Products (right side)
Element	Number of atoms	Number of atoms
Al	2	2
Cu	3	1
Cl	6	6

Step 9: Write the resulting equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$

We find that the equation is not balanced yet. As the number of copper atoms is unequal on the two sides.

Step 10: If we multiply 3 in the product (in Cu), we will get the equal number of atoms as in reactant (in $CuCl_2$)

No. of atoms of copper	Reactant (In $3CuCl_2$)	Product (in Cu)
Initially	3	1
To balance	3	1 × 3 = 3

Step 11: Write the resulting equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

We find that the equation is balanced now.

Step 12: Write down the final balanced equation:

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

9. Question

What happens chemically when quicklime is added to water?

Answer

When quicklime (calcium oxide- CaO) is added to water, it reacts vigorously with water to produce slaked lime (calcium

hydroxide) and releases a large amount of heat.

The reaction that takes place is:

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

Quick lime Slaked lime

The above reaction is an example of combination reaction in which calcium oxide and water combined together to form a single

product, calcium hydroxide.

10. Question

On adding dilute HCl to CuO powder, the solution formed is blue green. Predict the new compound formed which imparts a blue-green colour to the solution.

Answer

When HCl is diluted with copper oxide, the following reaction takes place:

$HCl + CuO \rightarrow CuCl_2 + H_2O$

The new compound formed is copper chloride ($CuCl_2$) which imparts a blue-green colour to the solution. The above reaction is a type of double displacement reaction.

11. Question

What happens when:

(a) copper powder is heated in a china dish?

(b) hydrogen gas is passed over hot copper (II) oxide?

Answer

(a)When copper powder is heated in the presence of air (oxygen), copper reacts with oxygen to form copper oxide. The copper

oxide formed is black in colour. The black colour is formed due to the oxidation of copper takes place.

The chemical equation of the reaction that takes place is given below:

$2Cu + O_2 \rightarrow 2CuO$

Copper oxide

(b) When hydrogen gas is passed over hot copper oxide, the black coating on the surface turns brown as the reverse reaction takes place and copper is obtained.

The reaction that takes place is:

$CuO + H_2 \rightarrow Cu + H_2O$

12. Question

A student has found black coating on his silver coins and green coating on his copper coins. Which chemical phenomenon is responsible for this? Write chemical name of these coatings.

Answer

The chemical phenomenon which is responsible is corrosion.

When a metal is attacked by substances around it such as moisture, acids, etc. it is said to corrode and this process is called corrosion.

After corrosion, the colour of:

Silver changes to → black

Copper changes to → green

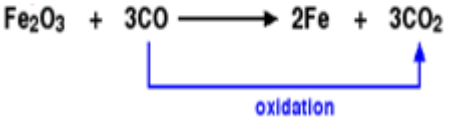
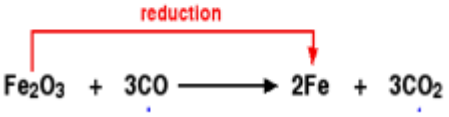
Hence, the chemical name of coatings are silver coating and copper coating.

13. Question

Give differences between Oxidation and Reduction.

Answer

Differences between oxidation and reduction are:

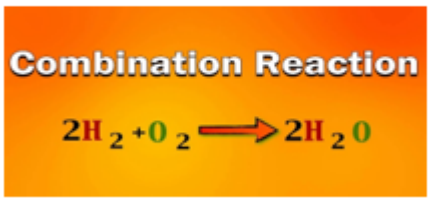
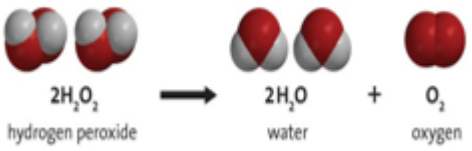
Oxidation	Reduction
i. Oxidation is the loss of electrons.	Reduction is the gain of electrons.
ii. If a substance loses oxygen during a reaction, it is said to be reduced.	If a substance gains oxygen during a reaction, it is said to be oxidized.
iii. The element which undergoes oxidation (gets oxidized) is called reducing agent.	The element which undergoes reduction (gets reduced) is called oxidizing agent.
iv. For example: 	For example: 

14. Question

How combination reaction differs from decomposition reaction?

Answer

Differences between combination reaction and decomposition reaction are:

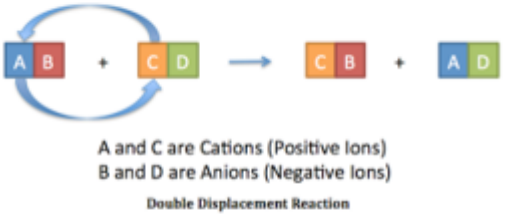
Combination reaction	Decomposition reaction
i. When two or more reactants combine together to form a single product, the reaction is called combination reaction. Reactant + reactant → 1 product	The reaction in which a single reactant breaks down to give simpler products is called decomposition reaction. Reactant → product + product
ii. For example: 	ii. For example: 

15. Question

Differentiate between displacement and double displacement reactions.

Answer

Difference between displacement and double displacement reactions:

Displacement reaction	Double displacement reaction
i. Displacement reaction is a reaction in which one element displaces other element from its compound and takes its place therein.  single displacement reaction	Double displacement reaction is a reaction in which there is an exchange of ions between the reactants take place.  A and C are Cations (Positive Ions) B and D are Anions (Negative Ions) Double Displacement Reaction
ii. For example: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ In the above reaction, Fe replaces Cu and form a new compound.	For example: When barium chloride solution is mixed with copper sulphate, the products formed: $BaCl_2 + CuSO_4 \rightarrow BaSO_4 + NaCl$

16. Question

What is observed when:

(i) Potassium iodide is added to aqueous lead nitrate?

(ii) Identify the type of reaction.

(iii) Give a balanced chemical equation for this.

Answer

(i) When potassium iodide is added to aqueous lead nitrate, it forms potassium nitrate and a precipitate of lead iodide which is yellow in colour.

The reaction that takes place is:

$Pb(NO_3)_2 + 2KI \rightarrow 2PbI + 2KNO_3$

Note: The insoluble substance formed is known as precipitate.

Precipitate settles down at the bottom of the test tube.

(ii) The type of reaction is double displacement reaction or precipitation reaction.

Any reaction that produces a produces a precipitate can be called a precipitation reaction.

(iii) The balanced chemical equation is:

$Pb(NO_3)_2 + 2KI \rightarrow 2PbI + 2KNO_3$

17. Question

Define oxidising and reducing agents by giving suitable example.

Answer

Oxidizing agent: An oxidizing agent is an element that gains electrons. Since the oxidizing agent means to gain electrons; it is

said to have been reduced.

The element which undergoes reduction (gets reduced) is called oxidizing agent.

For example: $2Mg + O_2 \rightarrow 2MgO$

In the given reaction, O_2 is reduced by losing oxygen atoms. Thus, O_2 is an oxidizing agent as it undergoes reduction.

Reducing agent: A reducing agent is an element that loses electrons. The reducing agent means to lose electrons; it is said to

have been oxidized.

The element which undergoes oxidation (gets oxidized) is called reducing agent.

For example:

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

In the given reaction, nitrogen is oxidized to NO by gaining oxygen atom. Thus, NH_3 is reducing agent as it undergoes oxidation.

18. Question

What is meant by rancidity? How it can be prevented?

Answer

When fats and oils are oxidized in the presence of air, they become rancid and their smell and taste change. This phenomenon is called rancidity.

Rancidity can be prevented by:

i. Using antioxidants- substances which prevent oxidation are called antioxidants. They are added to foods containing fats and oil.

For example, Nitrogen gas is filled in the packets of chips to prevent them from oxidation.

ii. Keeping food in air tight containers to slow down the process of oxidation.

19. Question

Give reason why:

(a) Magnesium ribbon should be cleaned before burning at air.

(b) Iron should be protected from moist air.

Answer

(a) Magnesium ribbon should be cleaned before burning at air because:

i. Magnesium is a very reactive metal.

ii. When it is stored, it forms a layer of magnesium oxide (MgO) by reacting with oxygen.

iii. This layer of MgO stops the further reaction of magnesium with oxygen.

iv. Thus, magnesium ribbon should be cleaned to before burning to air to remove this layer

(b) Iron should be protected from the moist air because:

i. When iron (a metal) is attacked by moist air (moisture), it is said to corrode.

ii. This process is called corrosion or rusting of iron.

iii. Rusting of iron causes damage to car bodies, bridges, iron railings to all objects made of iron.

iv. Every year a big amount of money is spent to replace damaged iron.

v. Hence, we should protect iron from moist air.

20. Question

What happens when:

(i) Lead nitrate is heated

(ii) crystals of $FeSO_4$ are heated?

Answer

(i) When lead nitrate [$Pb(NO_3)_2$] is heated, it forms lead oxide. The emission of brown fumes is also observed. These brown fumes are of nitrogen dioxide (NO_2).

The reaction that takes place is:

$Pb(NO_3)_2$ + heat → $2PbO + 4NO_2 + O_2$

Lead nitrate lead Nitrogen Oxide dioxide

The above reaction is an example of decomposition reaction in which single reactant breaks down to give simpler products.

(ii) When green crystals of ferrous sulphate [$FeSO_4$] are heated, the crystals lose water and the colour of the crystals changes. It then decomposes to ferric oxide [Fe_2O_3], sulphur dioxide, and Sulphur dioxide.

The reaction that takes place is:

$FeSO_4$ + heat → $Fe_2O_3 + SO_2 + SO_3$

Ferrous sulphate sulphur Sulphur dioxide trioxide

The above reaction is also an example of decomposition reaction.

21 A. Question

Give two examples each of:

Double displacement reactions.

Answer

The reaction in which there is an exchange of ions between the reactant takes place is called double displacement reaction.

A and C are Cations (Positive Ions)
B and D are Anions (Negative Ions)

Double Displacement Reaction

<u>For examples:</u>

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

Sodium Barium Barium Sodium

sulphate chloride sulphate chloride

$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

Silver Sodium Silver Sodium

nitrate chloride chloride nitrate

21 B. Question

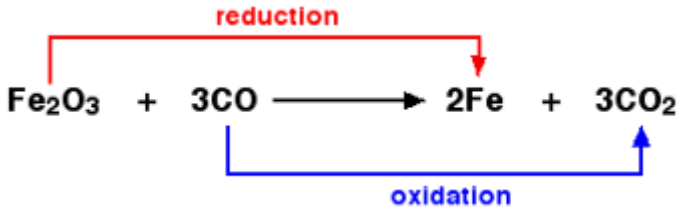
Give two examples each of:

Redox reactions

Answer

The reactions in which oxidation and reduction are taking place at the same time are called redox reactions.

For examples:



In the above example, Fe_2O_3 is reduced to Fe by losing oxygen atoms.

Thus, Fe undergoes reduction.

CO is oxidized to CO_2 by gaining oxygen atom. Thus, C undergoes oxidation.

$CuO + H_2 \rightarrow Cu + H_2O$

In the given reaction, CuO is reduced to Cu by losing oxygen. Thus, Cu undergoes reduction.

H_2 is oxidized to H_2O by gaining oxygen atom. Thus, H_2 undergoes oxidation.

21 C. Question

Give two examples each of:

Combination reactions.

Answer

Combination reaction is a reaction in which two or more reactants combined together to form a single product.

For examples:

When nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773K to form ammonia gas. The following reaction

takes place:

$$N_2(g) + 3H_2(g) \xrightarrow[773\ K]{\text{Catalyst}} 2NH_3(g)$$

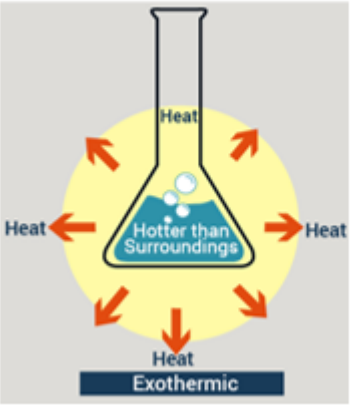
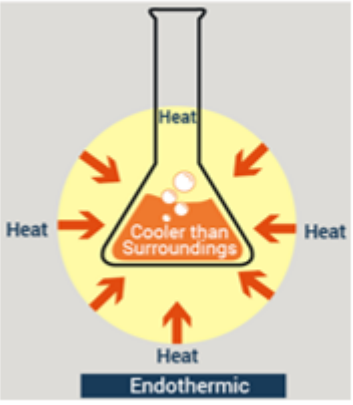
Formation of water from H_2 and O_2:

$2H_2 + O_2 \rightarrow 2H_2O$

22. Question

Differentiate between exothermic and endothermic reactions by giving one example of each. [3 marks]

Answer

Exothermic reaction	Endothermic reaction
i. Reaction in which heat is released along with the formation of products are called exothermic reactions	Reaction in which energy is absorbed is known as endothermic reaction.
ii. For example: Quick lime reacts vigorously with water releasing a large amount of heat: $CaO + H_2O \rightarrow Ca(OH)_2 + heat$	For example: When silver bromide is kept in sunlight, it forms silver and bromine: $2AgBr + sunlight \rightarrow 2Ag + Br_2$
iii. Products have more energy than reactants.	Products have more energy than reactants.
	

23 A. Question

Give reason why:

Na acts as a reducing agent while chlorine acts as an oxidising agent in reaction:

$2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$

Answer

$2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$

In the above reaction, sodium (Na) loses electrons and produces Na^+ Ions and thus Na acts as a reducing agent as it undergoes oxidation. On the other hand, chlorine gains electrons and forms chloride ions and thus chlorine acts as an oxidizing agent as it undergoes reduction.

23 B. Question

Give reason why:

White coloured AgCl turns grey when kept in sunlight.

Answer

White silver chloride turns grey in sunlight due to the decomposition of silver chloride into silver and chlorine by light.

The reaction that takes place is:

$2AgCl + sunlight \rightarrow 2Ag + Cl_2$

The above reaction is an endothermic reaction.

23 C. Question

Give reason why:

Colour of the solution changes when iron nail is dipped in copper sulphate solution.

Answer

Iron nails when left dipped in blue copper sulphate solution become brownish in colour and the blue colour of copper sulphate fades away.

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

The above reaction is a type of displacement reaction in which one element displaces another element from its compound and takes its place therein. In the reaction, Fe replaces Cu and form a new compound.

23 D. Question

Give reason why:

Lime water turns milky when CO_3 is passed through it?

Answer

When limewater $(CaOH)_2$ is passed through CO_2, the following reaction takes place:

$(CaOH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

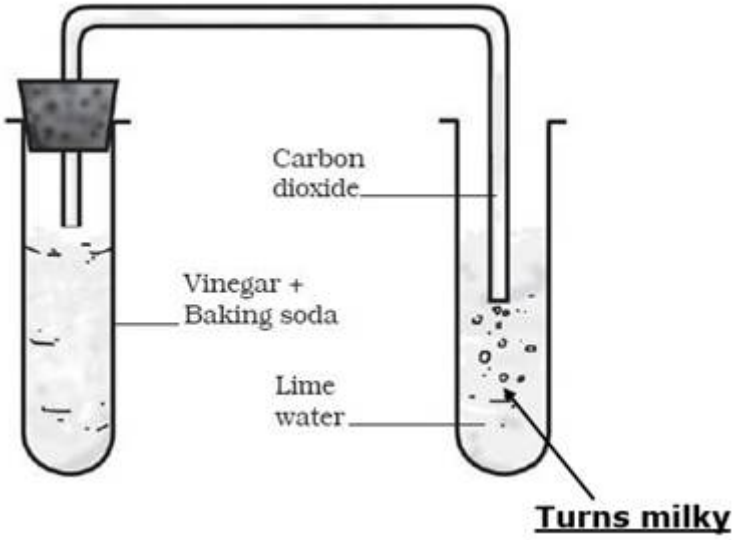
Limewater Calcium

Carbonate

i. In this reaction, when limewater comes in contact with the gas released in the form of an effervescence, it turns milky. This

chemical test for carbon dioxide gas.

ii. When limewater turns milky, it is confirmed that the effervescence is of carbon dioxide.



Comprehensive Exercises (MCQ)

1. Question

Calcium oxide reacts vigorously with water to produce:

A. Calcium hydroxide releasing a large amount of heat.

B. Calcium hydroxide absorbing a large amount of heat.

C. Calcium oxide and hydrogen with a release of large amount of heat.

D. Calcium oxide any hydrogen with a absorption of large amount of heat.

Answer

When calcium oxide- CaO is added to water, it reacts vigorously with water to produce slaked lime (calcium hydroxide) and releases a large amount of heat.

The reaction that takes place is:

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

Quick lime Slaked lime

2. Question

The reaction, $3MnO_2(s) + 4Al(s) \rightarrow 3Mn(\ell) + 2Al_2O_5(s) + Heat$ is

an example of:

A. Combination and exothermic reaction

B. Combination and endothermic reaction.

C. Displacement and exothermic reaction.

D. Displacement and endothermic reaction.

Answer

In the given reaction,

$3MnO_2(s) + 4Al(s) \rightarrow 3Mn(\ell) + 2Al_2O_5(s) + Heat$

Aluminum being more reactive displaces the manganese metal and forms a new compound. Hence it is a displacement reaction.

The heat is also released along with the formation of products, hence it is an exothermic reaction.

3. Question

Which is the reducing agent in the following reaction?

$MnO_2(s) + 4HCl\ (aq) \rightarrow MnCl_2(s) + 2H_2O(\ell) + Cl_2(\ell)$

A. $MnO_2(s)$

B. $HCl(aq)$

C. $MnCl_2(s)$

D. $Cl_2(g)$

Answer

HCl is oxidized by gaining oxygen atoms. Thus, HCl is a reducing agent as it undergoes oxidation.

4. Question

Which is the oxidizing agent in the following reaction?

$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(\ell)$

A. $CuO(s)$

B. $H_2(g)$

C. Cu(s)

D. $H_2O(\ell)$

Answer

CuO is reduced by losing oxygen atoms. Thus, CuO is a reducing agent as it undergoes reduction.

5. Question

The coating formed on the metals such as iron, silver and copper after corrosion will be:

A. Brown, black and green in colour.

B. Black, brown and green in colour.

C. Brown in colour in all the metals.

D. Black in colour in all the metals.

Answer

When a metal is attacked by substances around it such as moisture, acids, etc. it is said to corrode and this process is called corrosion.

After corrosion, the colour of:

Iron changes to → Reddish brown

Silver changes to → black

Copper changes to → green

6. Question

The changes which take place when fats and oils are oxidised:

A. They become better in taste.

B. They become rancid and give a good smell.

C. They become rancid and their smell and taste change.

D. The remain unaffected.

Answer

When fats and oils are oxidized, they become rancid and their smell and taste change. This phenomenon is called

rancidity. Basically, oxidation causes rancidity.

7. Question

The substances which get oxidised easily can be kept for longer duration by:

A. Adding oxygen and keeping them in sun for few days.

B. Adding nitrogen and keeping them in sun for few days.

C. Adding oxygen and keeping them in airtight containers.

D. Adding nitrogen and keeping them in airtight containers.

Answer

Nitrogen is an antioxidant which prevents oxidation. By keeping food in airtight containers by adding nitrogen helps to slow oxidation.

By keeping the fat/oil containing food materials in an open area or by adding oxygen can cause rancidity.

8. Question

The colour formed on the surface of copper powder when it is heated in a china dish:

A. Red

B. Blue

C. Green

D. Black

Answer

The colour formed on the surface of copper powder when it is heated in a china dish is black. Oxidation of copper takes place. As a result, copper oxide is formed which is black in colour.

9. Question

What happens when hydrogen gas is passed over the heated copper oxide (CuO)?

A. Black coating on the surface turns blue.

B. Black coating on the surface turns brown.

C. Black coating on the surface turns green.

D. Black coating on the surface turns white.

Answer

When hydrogen gas is passed over hot copper oxide, the black coating on the surface turns brown as the reverse reaction takes place and copper is obtained.

10. Question

The reaction which is used in black and white photograph is:

A. $2AgBr(s) \xrightarrow{sunlight} 2Ag(s) + Br_2(g)$

B. $CH_4(g) + Cl_2(g) \xrightarrow{sunlight} CH_3Cl(g) + HCl(g)$

C. $2NaCl(s) \xrightarrow{Electric\ current} Na(s) + Cl_2(g)$

D. $2KClO_3(s) \xrightarrow{Heat} 2KCl(s) + 3O_2(g)$

Answer

$2AgBr(s) + sunlight \rightarrow 2Ag(s) + Br_2(g)$

The above reaction is a type of decomposition reaction which is used in black and white photography.

11. Question

The following reaction is an example of a:

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

(i) displacement reaction

(ii) combination reaction

(iii) redox reaction

(iv) neutralization reaction

A. (i) and (iv)

B. (ii) and (iii)

C. (i) and (iii)

D. (iii) and (iv)

Answer

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$

The above reaction is a type of displacement reaction in which one element displaces other element from its compound.

It is also a redox reaction in which oxidation and reduction of a substance take place at the same time.

12. Question

Which of the following statements about the given reaction are correct?

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

(i) Iron metal is getting oxidised

(ii) Water is getting reduced

(iii) Water is acting as reducing agent

(iv) Water is acting as oxidizing agent

A. (i), (ii) and (iii)

B. (iii) and (iv)

C. (i), (ii) and (iv)

D. (ii) and (iv)

Answer

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$

In the above reaction, the iron metal is getting oxidized to Fe_3O_4 by gaining oxygen atoms. H_2O is getting reduced to H_2 by losing oxygen atom. Hence, water is an oxidizing agent as it undergoes reduction.

13. Question

Which of the following are exothermic processes?

(i) Reaction of water with quicklime

(ii) Dilution of an acid

(iii) Evaporation of water

(iv) Sublimation of camphor (crystals)

A. (i) and (ii)

B. (ii) and (iii)

C. (i) and (iv)

D. (iii) and (iv)

Answer

Quicklime reacts vigorously with water and releases a large amount of heat along with the formation of products. Hence it is an exothermic process. Dilution of acid is also an exothermic process.

14. Question

A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears. Which of the following is the correct explanation for the observation?

A. $KMnO_4$ is an oxidizing agent, it oxidizes $FeSO_4$

B. $FeSO_4$ acts as an oxidizing agent and oxidizes $KMnO_4$

C. The colour disappears due to dilution; no reaction is involved.

D. $KMnO_4$ is an unstable compound and decomposes in presence of $FeSO_4$ to a colourless compound.

Answer

Potassium permanganate ($KMNO_4$) is a strong oxidizing agent. It oxidizes $FeSO_4$.

15. Question

Which among the following is (are) double displacement reaction(s)?

(i) $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$

(ii) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

(iii) $C + O_2 \rightarrow CO_2$

(iv) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

A. (i) and (iv)

B. (ii) only

C. (i) and (ii)

D. (iii) and (iv)

Answer

The reaction (i) is a type of displacement reaction as Pb displaces Cu and form a new compound $PbCl_2$

The reaction (ii) is a type of double displacement reaction in which exchange of ions takes place.

The reaction (iii) is a type of combination reaction in which carbon and oxygen are combined together to form a single product that is CO_2.

The reaction (iv) is a type of exothermic reaction as the burning of

natural gas (CH_4) releases a large amount of energy.

16. Question

Which among the following statement(s) is(are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to:

(i) The formation of silver by decomposition of silver chloride

(ii) Sublimation of silver chloride

(iii) Decomposition of chlorine gas from silver chloride

(iv) Oxidation of silver chloride

A. (i) only

B. (i) and (iii)

C. (ii) and (iii)

D. (iv) only

Answer

White silver chloride turns grey in sunlight due to the decomposition of silver chloride into silver and chlorine by light.

The reaction that takes place is:

$2AgCl + \text{sunlight} \rightarrow 2Ag + Cl_2$

17. Question

Which of the following is(are) an endothermic process(es)?

(i) Dilution of sulphuric acid

(ii) Sublimation of dry ice

(iii) Condensation of water vapours

(iv) Evaporation of water

A. (i) and (iii)

B. (ii) only

C. (iii) only

D. (ii) and (iv)

Answer

Reaction in which energy is absorbed is known as endothermic reaction. Hence, sublimation of dry ice and evaporation of water are endothermic reactions as they both involve adsorption of heat.

18. Question

In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate?

A. Lead sulphate (insoluble)

B. Lead acetate

C. Ammonium nitrate

D. Potassium sulphate

Answer

If lead nitrate is not available, we can use lead acetate in place of it. We cannot use lead sulphate because it is insoluble. In ammonium nitrate and potassium sulphate, the ions are different. We can only use the compound of Pb not any other metal.

19. Question

In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature?

A. $2H_2(\ell) + O_2(\ell) \rightarrow 2H_2O(g)$

B. $2H_2(g) + O_2(\ell) \rightarrow 2H_2O(\ell)$

C. $2H_2(g) + O_2(g) \rightarrow 2H_2O(\ell)$

D. $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

Answer

In reaction (c), H_2 and O_2 are in gaseous state and the product formed that is water is in liquid state. This represents the correct state of the reactants and products.

20. Question

Which of the following are combination reactions?

(i) $2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$

(ii) $MgO + H_2O \rightarrow Mg(OH)_2$

(iii) $4Al + 3O_2 \rightarrow 2Al_2O_3$

(iv) $Zn + FeSO_4 \rightarrow ZnSO_4 + Fe$

A. (i) and (iii)

B. (iii) and (iv)

C. (ii) and (iv)

D. (ii) and (iii)

Answer

In reaction (ii), $MgO + H_2O \rightarrow Mg(OH)_2$

MgO and water combined together to form a single product, i.e., magnesium hydroxide.

In reaction (iii), $4Al + 3O_2 \rightarrow 2Al_2O_3$

Aluminium combines with oxygen to form a single product. i.e., aluminum oxide

Hence, both are examples of combination reactions.

Comprehensive Exercises (T/F)

1. Question

Write true or false for the following statements:

On heating the crystals of ferrous sulphate, the colour changes from green to grey.

Answer

False

When green crystals of ferrous sulphate ($FeSO_4$) are heated, the crystals lose water and the colour of the crystals changes to brown. This is decomposition reaction.

Hence, the give statement is false.

2. Question

Write true or false for the following statements:

Calcium oxide is also called lime quicklime.

Answer

True

Calcium oxide (CaO) is also called quicklime. Quick lime is formed when calcium carbonate (limestone) is heated. This is also an example of decomposition reaction.

Hence, the give statement is true.

3. Question

Write true or false for the following statements:

On heating the crystals of lead nitrate crystals, the emission of brown fumes occurs.

Answer

True

When crystals of lead nitrate [$Pb(NO_3)_2$] is heated, it forms lead oxide. The emission of brown fumes is observed. These brown fumes are of nitrogen dioxide (NO_2).

Hence, the give statement is true.

4. Question

Write true or false for the following statements:

The thermal decomposition reaction of calcium sulphate (gypsum) is used in black and white photography.

Answer

False

The thermal decomposition reaction of calcium sulphate (gypsum) is not used in black and white photography. The

reaction of silver bromide with sunlight to for silver and bromine used in black and white photography.

Hence, the give statement is false.

5. Question

Write true or false for the following statements:

The decomposition reaction of silver bromide into silver and bromine by light is used in the manufacturing of cement.

Answer

False

The decomposition reaction of silver bromide into silver and bromine by light is used in black and white photography.

The reaction that takes place is:

$2AgBr + sunlight \rightarrow 2Ag + Br_2$

Hence, the give statement is false.

6. Question

Write true or false for the following statements:

The insoluble substance formed during a chemical reaction is known as a precipitate.

Answer

True

The insoluble substance formed during a chemical reaction is known as a precipitate. The precipitate formed in a double displacement reaction.

Hence, the given statement is true.

7. Question

Write true or false for the following statements:

During endothermic reactions, heat is transferred from the reacting substances to the surroundings.

Answer

False

During endothermic reactions, heat is transferred from the surroundings to the reacting substances. On the other hand, heat is transferred from the reacting substances to the surroundings.

Hence, the given statement is false.

8. Question

Write true or false for the following statements:

The reaction $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$ is type of double displacement reaction

Answer

False

The reaction is an example of displacement reaction in which zinc metal displaces other metal, i.e., copper from $CuSO_4$ to form a new compound $ZnSO_4$.

Hence, the given reaction is false.

9. Question

Write true or false for the following statements:

Keeping food in airtight containers helps to slow down oxidation.

Answer

True

Keeping food in airtight containers helps to slow down oxidation. Airtight containers prevent the food materials from

getting oxidized.

Hence, the given statement is true.

10. Question

Write true or false for the following statements:

Due to corrosion iron gets a brown coating, copper gets a green coating and silver gets a black coating.

Answer

True

When a metal is attacked by substances around it such as moisture, acids, etc. it is said to corrode and this process is called corrosion.

After corrosion, the colour of:

Iron changes to → Reddish brown

Silver changes to → black

Copper changes to → green

Hence, the given statement is true.