CHEMICAL REACTION AND EQUATION
(BY RUPESH GUPTA SIR)

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01. Wł	v should a	magnesium	ribbon	be cleaned	before	burning in	air?
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Ans. Magnesium ribbon is exposed in air; a layer of oxide is deposited on its surface. This oxide layer on magnesium hinders the burning of magnesium. Hence this oxide layer is removed by rubbing with sand paper before burning so magnesium ribbon can easily burns

before burning so magnesium ribbon can easily burns.
Q2. Write the balanced equation for the following chemical reactions. (1) Hydrogen + Chlorine → Hydrogen Chloride (2) Barium Chloride + Aluminium Sulphate → Barium Sulphate + Aluminium chloride (3) Sodium + water → Sodium Hydroxide + Hydrogen
Ans. (1) Hydrogen + Chlorine → Hydrogen Chloride
This chemical equation can be written in symbolic form as
H_2 + Cl_2 \rightarrow HCl
Hence balanced chemical equation is
$H_2 + Cl_2 \rightarrow 2HCl$
(2) Ba rium Chloride + Aluminium Sulphate → Barium Sulphate + Aluminium chloride
This chemical equation can be written in symbolic form as
$BaCl_{2} + Al_{2}(SO_{4})_{3} \rightarrow BaSO_{4} + AlCl_{3}$
Hence balanced chemical equation is
$3BaCl_{2} + Al_{2}(SO_{4})_{3} \rightarrow 3BaSO_{4} + 2AICl_{3}$
(3) Sodium + water → Sodium Hydroxide + Hydrogen
This chemical equation can be written in symbolic form as
Na + $H_2O \rightarrow NaOH + H_2$
Hence balanced chemical equation is
2Na + $2H_2O \rightarrow 2NaOH + H_2$
O2 Muito a halaward showing any ation with state symbols for the following reactions
Q3. Write a balanced chemical equation with state symbols for the following reactions. (1) Solution of barium Chloride and sodium sulphate in water react to give insoluble barium sulphate
and the solution of sodium chloride.
(2) Sodium hydroxide solution (in Water) reacts with hydrochloric acid solution (in water) to produce
sodium chloride solution and water.
Ans. (1) Barium chloride + Sodium sulphate → Barium sulphate + Sodium Chloride
(Solution) (Solution) (Insoluble) (Solution)
This chemical equation can be written in symbolic form as
$BaCl_2(aq)$ + $Na_2SO_4(aq)$ \rightarrow $BaSO_4(ppt)$ + $NaCl(aq)$
Hence balanced chemical equation is
$BaCl_2(aq)$ + $Na_2SO_4(aq)$ \rightarrow $BaSO_4(ppt)$ + $2NaCl(aq)$
(2) Sodium Hydroxide + Hydrochloric Acid → Sodium Chloride + Water
(solution) (solution) (solution)
This chemical equation can be written in symbolic form as
NaOH (aq) + HCl (aq) \rightarrow NaCl (aq) + H ₂ O (l)
Hence balanced chemical equation is
NaOH (ag) + HCl (ag) \rightarrow NaCl (ag) + H ₂ O (I)

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Q1. A solution of substance 'X' is used for white washing.							
(1) Name the substance 'X' and write its formula.							
(2) Write the reaction of substance 'X' named in (1) above with water.							
Ans. (1) The substance 'X' is quick lime (Calcium oxide) and its formula is CaO							
Calcium oxide react with water to form calcium hydroxide (Slaked lime)							
$Cao(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ Calcium ovido Water Calcium bydrovido							
Calcium oxide Water Calcium hydroxide							
Q2. Why the amount of gas collected in one of the test tubes in activity 1.7 double of the amount collected							
in the other? Name this gas.							
Ans. On electrolysis, water decomposes to give hydrogen and oxygen as shown in equation							
2H ₂ O (I) on passing electric current 2H ₂ (g) + O ₂ (g)							
Thus water decomposes to give hydrogen and oxygen in the ratio of 2:1 by volume. The double volume of the							
gas collected is hydrogen.							
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Q1. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?							
Ans. Iron is more reactive than copper so it displace copper from copper sulphate to form iron sulphate							
solution.							
Fe + CuSO ₄ \rightarrow FeSO ₄ + Cu							
Copper sulphate iron sulphate							
(Blue colour solution) (Green colour solution)							
Q2. Give an Example of a double displacement reaction other than the one give in activity 1.10							
Ans. AgNO ₃ (aq) + NaCl (aq) \rightarrow AgCl (s) + NaNO ₃ (aq)							
Silver Nitrate sodium chloride silver chloride sodium nitrate							
Silver Willate Sociality Chloride Silver chloride Sociality Micrael							
Q3. Identify the substances that are oxidized and the substances that are reduced in the following reaction							
(1) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$							
(2) CuO (s) + $H_2(g) \rightarrow Cu$ (s) + H_2O (I)							
Ans. (1) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$							
Na has gained oxygen to form Na_2O . Hence Na has been oxidized to Na_2O and O_2 has been reduced							
(2) CuO (s) + $H_2(g) \rightarrow Cu(s) + H_2O(l)$							
CuO has lost oxygen to form Cu. Hence CuO has been reduced to Cu. And H_2 has gained oxygen to form							
H_2O hence; H_2 has been oxidized to H_2O .							
$\Gamma V \Gamma D C I C \Gamma C$							

<u>EXERCISES</u>

Q1. Look in NCERT

Ans. (1) is the correct option

Q2. Look in NCERT

Ans. Option (d) is correct

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()~	Loo	k in	N	FRI

Potassium

Κ

Ans. Option (a) is correct

Q4. What is the balanced chemical equation? Why should a chemical equation be balanced?

Ans. A chemical equation has an equal number of atoms of different elements in the reactants and products are said to be balanced chemical equation.

According to law of conservation of mass, the total mass of the reactant side is equal to the total mass of product side it is only possible when the number of atoms are equal in both the side so to full fill the law of conservation of mass equations are balanced.

05	Translate the	following statement	ts into chemica	l equations and then	halanced them
us.	Translate the	TOHOWING Statemen	is into chemica	i eduations and then	palanceu mem

(a) Hydrogen gas combines with nitrogen to form ammonia.

This equation in symbolic form can be re-present as

- (b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide
- (c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- (d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Ans. (a) Hydrogen gas combines with nitrogen to form ammonia this statement can be written as in word equation as → Ammonia Hydrogen Nitrogen

	H_2	+	N_2	\rightarrow	NH_3									
	Hence	, balanc	ed equa	tion is										
	$3H_2$	+	N_2	\rightarrow	$2NH_3$									
(b)Hydro	gen su	lphide ga	as burn	s in air	to give v	water ar	nd sulpl	nur dioxide	this sta	iteme	ent can b	e written a	S
in wor	d equat	ion as												
	Hydro	gen sulp	ohide	+	Oxygei	า		\rightarrow	water +	sul	phur	dioxide		
	This ed	quation	in symb	olic for	m can b	e re-pr	esent as	5						
	H_2S	+	O_2	\rightarrow	H_2O	+	SO_2							
	Hence	, balanc	ed equa	tion is										
	$2H_2S$	+	3O ₂	\rightarrow	$2H_2O$	+	$2SO_2$							
((C)Bariur	n chlori	de react	s with a	alumini	um sulp	hate to	give alu	ıminium ch	lloride a	ınd a	precipita	ate of	
bariun	n sulpha	te this	stateme	nt can l	be writt	en as ir	word e	equation	n as					
	Barium	n chlorid	de	+	Alumir	ium sul	phate	→ Alur	minium chlo	oride	+ B	3arium s	ulphate	
	This ed	quation	in symb	olic for	m can b	e re-pr	esent as	5						
	$BaCl_2$	+	Al ₂ (SO ₄) ₃	\rightarrow	AlCl ₃	+	$BaSO_4$						
	Hence	, balanc	ed equa	tion is										
	3BaCl ₂	+	Al ₂ (SO ₄) ₃	\rightarrow	2AlCl ₃	+	3BaSO	4					
(1	D) Potas	sium m	etal rea	cts with	n water	to give	potassiu	ım hydi	roxide and	hydroge	en gas	s this sta	atement car	1
be wri	tten as	in word	equatio	n as.										

Hэ

 H_2

+Hydrogen

Water → Potassium hydroxide

KOH

2KOH +

This equation in symbolic form can be re-present as

 \rightarrow

 H_2O

2H₂O →

Hence, balanced equation is

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Q6. Balanced the following chemical equations

(a) HNO₃ +	Ca(OH)₂	\rightarrow	$Ca(NO_3)_2$	+	H ₂ O
(b) NaOH +	H ₂ SO ₄	\rightarrow	Na ₂ SO ₄	+	H ₂ O
(c) NaCl +	AgNO₃	\rightarrow	AgCl	+	NaNO₃
(d) BaCl ₂ +	H ₂ SO ₄	\rightarrow	BaSO₄	+	HCl

Ans. Balanced chemical equations are

(a) 2HNO₃ +	Ca(OH)₂		→ Ca(NO ₃) ₂	+ 2H ₂ O
(b) 2NaOH+	H_2SO_4	\rightarrow	Na_2SO_4	+	2H ₂ O
(c) NaCl +	AgNO ₃	\rightarrow	AgCl	+	NaNO₃
(d) $BaCl_2 +$	H_2SO_4	\rightarrow	BaSO ₄	+	2HCl

Q7. Write the balanced chemical equations for the following reactions

(a) Calcium hydro	oxide + carbor	n dioxide	calcium carbonate	+ water
(b) Zinc +	silver nitrate →	zinc nitrate	+ silver	
(c) Aluminium	+ copper chloric	de →	Aluminium chloride +	copper
(d) Barrium chlor	ide + Potassium sul	phate 🔿	Barium sulphate +	potassium chloride
Ans. (a) Ca(OH)₂	+ CO ₂ →	CaCO ₃ +	H ₂ O	
(b) Zn +	2AgNO₃ →	$Zn(NO_3)_2$	+ 2Ag	
(c) 2Al +	3CuCl₂ → 2AlCl₃	+ 3Cu		
(d) $BaCl_2$ +	$K_2SO_4 \rightarrow BaSO_4$	+ 2KCl		

Q8. Write the balanced chemical equation for the following and identify the type of reaction in each case.

- (a) Potassium bromide(aq) +Barium iodide (aq) → potassium iodide (aq) + Barium bromide(s)
- (b) Zinc carbonate (s) → Zinc oxide (s) + Carbon dioxide (g)
- (c) Hydrogen (g) + Chlorine (g) → Hydrogen chloride (g)
- (d) Magnesium (s) + Hydrochloric Acid (aq) → Magnesium chloride (aq) + Hydrogen (g)

Ans (a)
$$2KBr(aq) + Bal_2(aq) \rightarrow 2KI(aq) + BaBr_2$$

This is a double displacement reaction

(b)
$$ZnCo_3(s) \rightarrow ZnO(s) + CO_2(g)$$

This is decomposition reaction

(c)
$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

This is combination reaction

(d) Mg (s) + 2HCl (aq)
$$\rightarrow$$
 MgCl₂ (aq) + H₂(g)

This is displacement reaction

Q9. What does one mean by exothermic and endothermic reactions? Give examples

Ans **Exothermic Reactions**: - Those chemical reactions in which heat is released are called exothermic reactions. It is indicated by writing '+ Heat on product side'

Example: - when methane burns in air (i.e. combustion) a lot of heat energy is released.

$$CH_4(g)$$
 + $2 O_2(g)$ \rightarrow $CO_2(g)$ + $2 H_2O(g)$ + Heat
Methane Oxygen Carbon dioxide Water
(From air) (as steam)

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Endothermic reactions: - Those chemical reactions in which heat is absorbed are called endothermic reactions. It is indicated by writing '+ Heat on Reactant side'

Example: - When nitrogen and oxygen are heated to a very high temperature, they combine to form nitrogen monoxide, and a lot of heat is absorbed in this reaction.

 $O_2(g)$ + Heat \rightarrow 2NO(g) $N_2(g) +$

Nitrogen Oxygen Nitrogen monoxide

Q10. Why is respiration considered an exothermic reaction? Explain.

Ans. During the respiration food is oxidizes to give carbon dioxide and water and heat is released. Such reaction in which heat is released known as exothermic reaction so hence, In respiration heat is released so it is an exothermic reaction.

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

Ans. In decomposition reactions, a single substance is break to give two or more substances while in combination reaction two or more substances combine to give a single substance so hence decomposition reaction is opposite to combination reaction.

Example: - Water on electrolysis decomposes to give hydrogen and oxygen is a decomposition reaction

 $2H_2O$ Electricity > $2H_2$ O_2 Water Hydrogen Oxygen

Whereas hydrogen and oxygen combine to give water is a combination reaction

2H₂ 02 \rightarrow 2H₂O Hydrogen Oxygen Water

Q12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Ans. Example: - Decomposition by heat

When calcium carbonate is heated, it decomposes to give calcium oxide and carbon dioxide.

CaCO₃ Heat, Decomposes > CaO CO₂

carbon dioxide Calsium carbonate calcium oxide

Example: - Decomposition by electricity

When electric current is passed through acidified water, it decomposes to give hydrogen gas and oxygen gas.

> 2H₂O Electricity > 2H₂ O_2 Water Hydrogen Oxygen

This reaction is known as electrolysis of water.

Example: - Decomposition by light

Silver chloride decomposes in presence of sunlight to give silver and chloride.

Silver chloride turns grey in sunlight

2AgCl(s) sunlight > $Cl_2(g)$ 2Ag (s) Silver chloride silver chlorine

(Grey in colour)

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Q13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans.

Ans.	
Displacement reaction	Double displacement reaction
1. Those reactions, in which one element takes the place of another element in a compound, are known as displacement reactions. A more reactive element displacement a less reactive element from its compound.	Those reaction in which two compound react by an exchange of ions to form two new compounds are called double displacement reactions. These reactions also known as metathesis reactions.
2. In displacement reaction an element and a compound is react.	In double displacement reaction two compounds are react
Example: -When a strip of zinc metal is placed in copper sulphate solution, then zinc sulphate solution and copper are obtained. CuSO ₄ (aq) + Zn (s) -> ZnSO ₄ (aq) +	Example: 1. When silver nitrate solution is added to sodium chloride solution, then a white ppt of silver chloride is formed along with sodium nitrate solution. AgNO₃(aq) +NaCl (aq) →AgCl (s) +
Cu (s) Cu (s) Coppersulphate zinc zinc sulphate copper	NaNO ₃ (aq) +NaCi (aq) -7 AgCi (s) + NaNO ₃ (aq) Silver Nitrate sodium chloride silver chloride sodium
(Blue solution)	nitrate
Q14. In the refining of silver, the recovery of silver from silve Write down the reaction involved. Ans. Cu (s) + 2AgNO₃ (aq) → Cu(NO₃)₂ (aq) Copper Silver nitrate Copper nitrate Q15. What do you mean by a precipitation reaction? Explain Ans. Precipitation Reaction: - precipitation reaction are the remain in the solution) is formed Example: - Barium chloride solution reacts with aluminium substitution and the solution BaCl₂ + Al₂(SO₄)₃ →	+ 2Ag (s) Silver n by giving example ose reaction in which precipitate (i.e. undissolve substance
Q16. Explain the following in terms of gain or loss of oxyger	minium Chloride Barium Sulphate n with two examples each.
(a) Oxidation (b) Reduction Ans. Oxidation: - It is the process which involves gain of oxyge Example: - (1) 2Mg (s) + O₂ (g) → 2MgO(s) Mg gained oxygen to form MgO. Hence, Mg has be (2) CuO (s) + H₂(g) → Cu(s) + H₂O (g) H₂ has gained oxygen to form H₂O. Hence H₂ has Reduction: - It is the process which involves loss of oxygen. Example: -(1) ZnO (s) + C (s) → Zn (s) + CO (g) ZnO has lost oxygen to form Zn. Hence ZnO has been	een oxidized to MgO. been oxidized to H₂O.

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

CuO has lost oxygen to form Cu. Hence CuO has been reduced to Cu

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Q17. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and black coloured compound formed.

Ans. The shiny brown coloured element is Copper

When copper is heated in air it combine with oxygen to form a black coloured compound copper (II) oxide [CuO]

 $2Cu(s) + O_2(g) \rightarrow 2CuO(s)$

Q18. Why do we apply paint on iron articles?

Ans. Paint covers the surface of iron articles. Hence, moist air cannot attack iron and prevent rusting.

Q19. Oil and fat containing food items are flushed with nitrogen. Why?

Ans. In the presence of oxygen of the air, the fats present in the fatty food are oxidized to copounds which have bad smell (i.e. food is rancid) flushing with nitrogen cuts off oxygen and protects the food from rancidity.

Q20. Explain the following terms with one example each.

(a) Corrosion

(b) Rancidity

Ans. <u>Corrosion</u>: - "The eating up of metal by the action of air and moisture on their surface is called corrosion." For example- iron metal corrodes when kept in damp air for a considerable time, and then a red brown substance called rust ($Fe_2O_3.xH_2O$) is formed on its surface. Rust is soft and porous

Rancidity: - The oxidation of oils or fats in a food resulting into a bad smell and bad taste is called rancidity Example: - A bad smell coming from food is an example of rancidity