

CLASS 10TH MID TERM

**SCORE
BOOSTER**

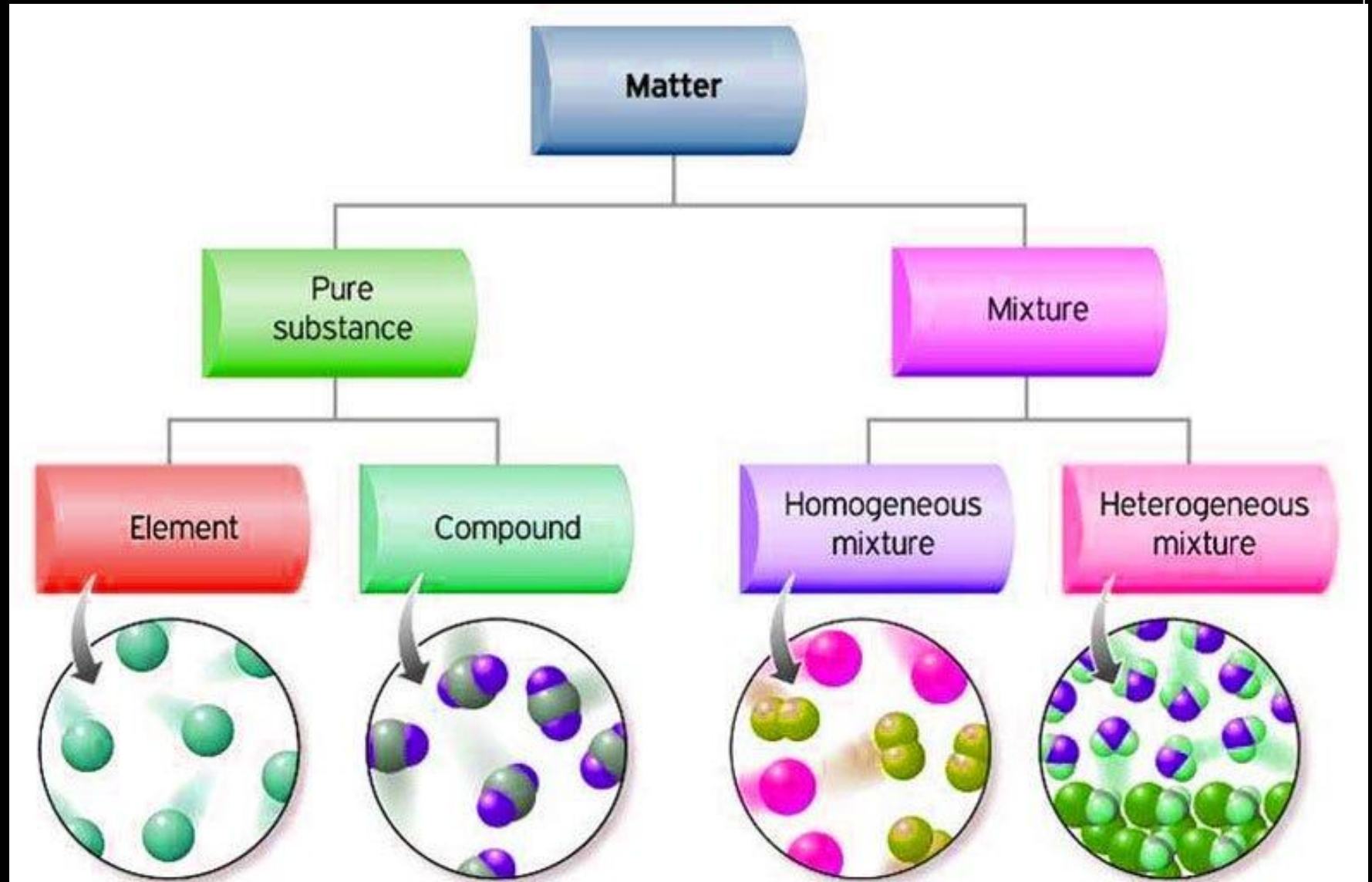


**Metals &
Nonmetals**

ONESHOT

CHEMISTRY

1. Classification of Matter



Periodic Table of the Elements

Total Elements : 118

Metals: 90

Nonmetals: 22 and few metalloids

1 1IA 1A H Hydrogen 1.008	2 IIA 2A He Helium 4.003											13 IIIA 3A B Boron 10.811	14 IVA 4A C Carbon 12.011	15 VA 5A N Nitrogen 14.007	16 VIA 6A O Oxygen 15.999	17 VIIA 7A F Fluorine 18.998	18 VIIIA 8A Ne Neon 20.180
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.99	12 Mg Magnesium 24.305	3 IIIB 3B Sc Scandium 44.956	4 IVB 4B Ti Titanium 47.867	5 VB 5B V Vanadium 50.942	6 VIB 6B Cr Chromium 51.996	7 VIIB 7B Mn Manganese 54.938	8 VIII 8 Fe Iron 55.845	9 VIII 8 Co Cobalt 58.933	10 VIII 8 Ni Nickel 58.693	11 IB 1B Cu Copper 63.546	12 IIB 2B Zn Zinc 65.38	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.789
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.294
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [280]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [286]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]

Lanthanide Series

57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967
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Actinide Series

89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]
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Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetal	Nonmetal	Halogen	Noble Gas	Lanthanide	Actinide
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2. Physical Properties of Metals and Nonmetals

	Metals	Nonmetals
Conduction		
Ductility		
Malleability		
Lustre		
Sonority		
Density		
Physical State		
Hardness		
Melting & Boiling Point		

3. Chemical Properties of Metals and

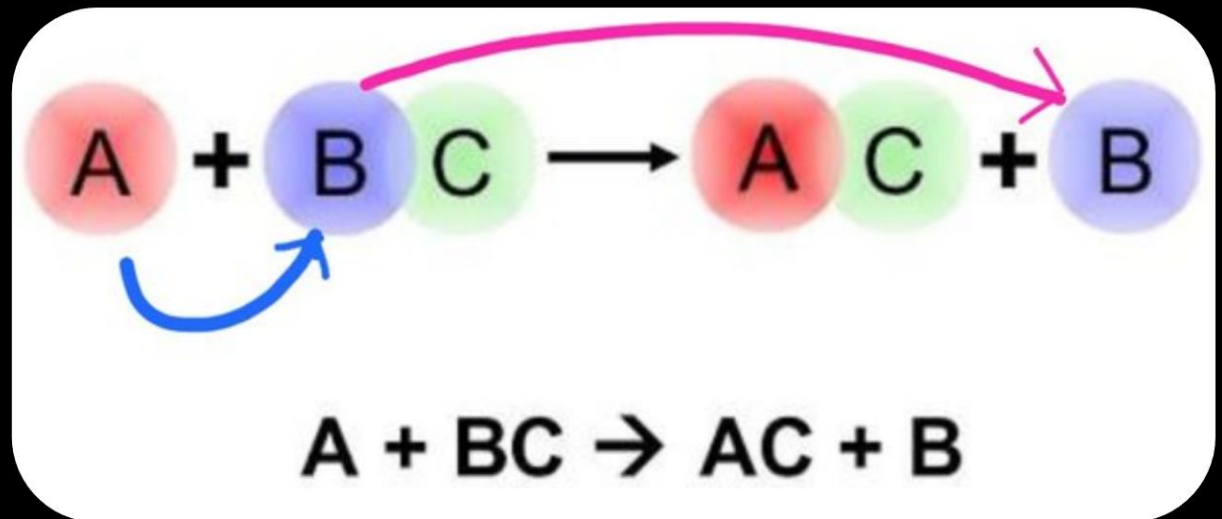
Nonmetals

	Metals	Nonmetals
Valence electrons	1,2,3	5,6,7
Electrons donor/acceptor	donors	Acceptors
Electro positive/negative	electropositive	Electronegative
Oxide type	basic	Acidic
Corrosive	yes	no
Type of Ion	cation	Anion
Reducing & Oxidising		

4. Chemical Reactions of Metals and Nonmetals

4.1. Displacement Reaction

- **Displacement Reaction - A more reactive metal displaces a less reactive metal from its salt solution.**



4. Chemical Reactions of Metals and Nonmetals

4.2. Reaction of Metals with Water

- **Metals react with water and produce a metal oxide and hydrogen gas.**
- **Metal oxides that are soluble in water dissolve in it to further form metal hydroxide.**
- **But all metals do not react with water.**

Metal + Water → Metal oxide + Hydrogen

Metal Oxide + Water → Metal Hydroxide


4. Chemical Reactions of Metals and Nonmetals

4.2. Reaction Metals with Water

Metals	Reacts with	Products
Na	cold water	NaOH, H ₂
K	cold water	KOH, H ₂
Ca	hot water	Ca(OH) ₂ , H ₂
Mg	hot water	Mg(OH) ₂ , H ₂
Zn	Steam	ZnO, H ₂
Fe	Steam	Fe ₃ O ₄ , H ₂
Al	Steam	Al ₂ O ₃ , H ₂

4. Chemical Reactions of Metals and Nonmetals

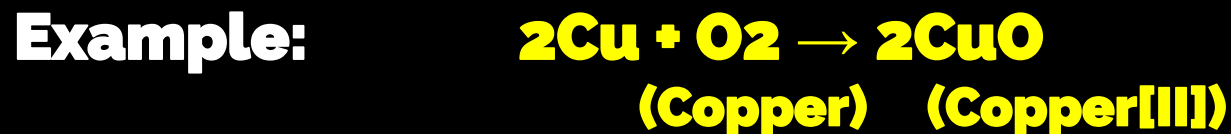
4.3. Reactivity of Metal

K	Potassium		Most reactive
Na	Sodium		
Ca	Calcium		
Mg	Magnesium		
Al	Aluminium		
Zn	Zinc		Reactivity decreases
Fe	Iron		
Pb	Lead		
H	Hydrogen		
Cu	Copper		
Hg	Mercury		
Ag	Silver		
Au	Gold		Least reactive

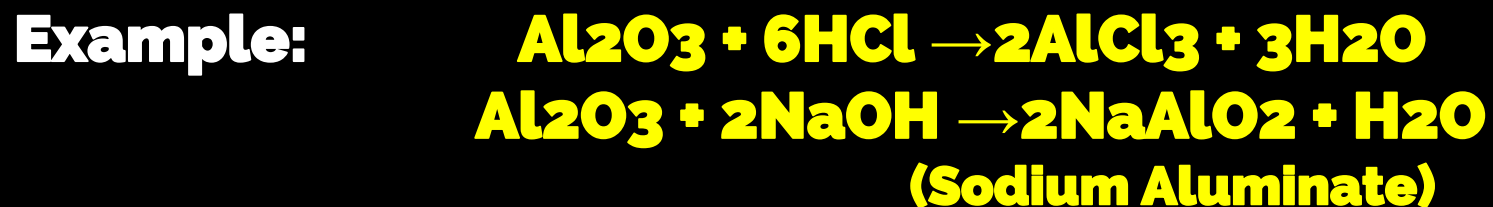
4. Chemical Reactions of Metals and Nonmetals

4.4. Reaction Metals & Nonmetals with O₂

- **Metals combine with oxygen to form basic oxides.**



- **Aluminium oxide and zinc oxide show the properties of both basic as well as acidic oxides. These oxides are known as **amphoteric oxides**.**



- **Non-metals form oxides which are either acidic or neutral**



4. Chemical Reactions of Metals and Nonmetals

4.5. Reaction Metals with dilute acids

- **Metal + Dilute Acids \rightarrow Salt + Hydrogen**
- **Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O , NO , NO_2).**
- **But magnesium (Mg) and manganese (Mn) react with very dilute HNO_3 to evolve H_2 gas.**
- **Metals above hydrogen in the Activity series can displace hydrogen from dilute acids.**

4. Chemical Reactions of Metals and Nonmetals

4.5. Reaction Metals with dilute acids

Element	Reaction with dilute hydrochloric acid
potassium	very violent- very explosive
sodium	very violent- explosive
calcium	very rapid- lots of hydrogen produced
magnesium	rapid- bubbles of hydrogen produced steadily
zinc	slow- bubbles of hydrogen produced slowly
iron	slow reaction- some bubbles produced
hydrogen	no reaction
copper	no reaction

4. Chemical Reactions of Metals and Nonmetals

4.6. Reaction Metals with Nonmetals

Metal + Non-Metals → Salt (IONIC COMPOUND)

- **Physical Nature:** Ionic compounds are solids and are somewhat hard because of the strong force of attraction between the positive and negative ions.
- **Melting and boiling point:** Ionic compounds have high melting and boiling points.
- **Solubility:** Electrovalent compounds are generally soluble in water and insoluble in solvents such as kerosene, petrol, etc.
- **Conduction of Electricity:** The conduction of electricity through a solution involves the movement of charged particles. A solution of an ionic compound in water contains ions, which move to the opposite electrodes when electricity is passed through the solution.

5. Occurrence of Metals

The earth's **CRUST** is the major source of metals.

METALLURGY: The branch of science and technology concerned with the properties of metals and their production and purification.

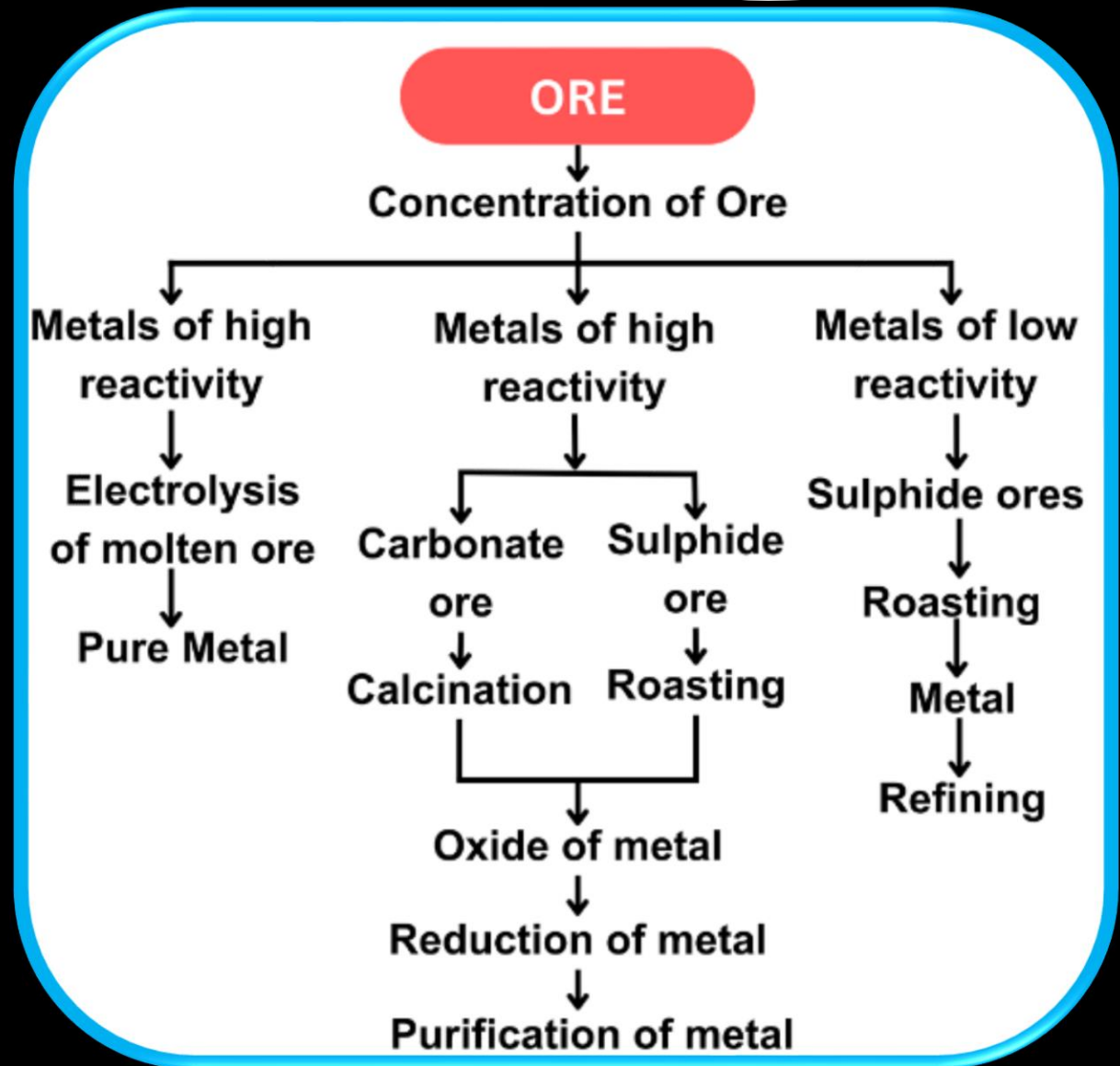
MINERALS: The elements or compounds, which occur naturally in the earth's crust.

ORES: Those minerals which contain a very high percentage of a particular metal and the metal can be profitably extracted from it are called ores.

GANGUE PARTICLES: Impurities present in ores in the form of sand, soil, dust etc.

ENRICHMENT OF ORE OR CONCENTRATION OF ORE:
The process of removal of gangue particles from ores.

6. Extraction of Metals



6. Extraction of Metals

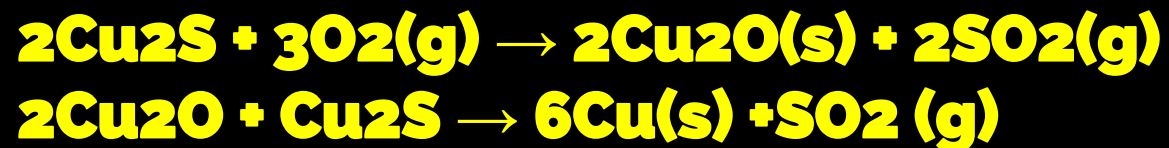
6.1. Extracting Metals low in reactivity

The oxides of these metals can be reduced to metals by heating alone.

For example, cinnabar (HgS) is an ore of mercury.

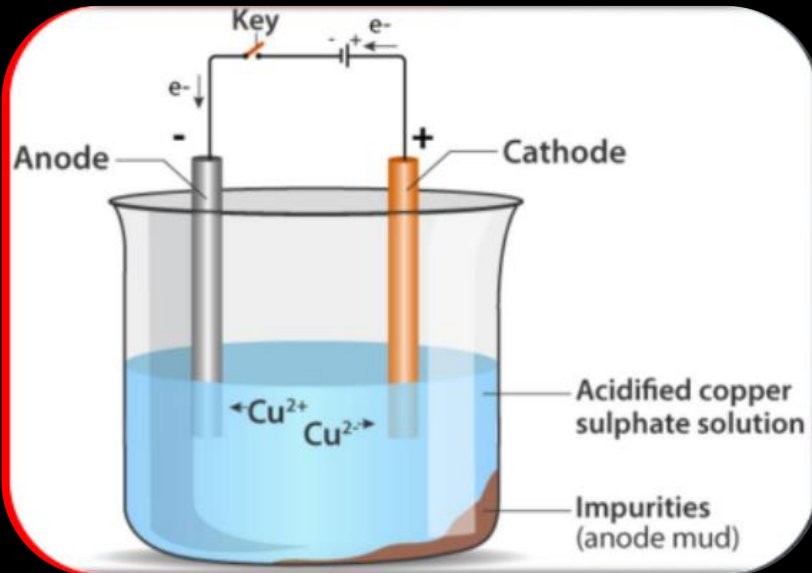


Extraction of Copper



7. Refining of metals

Electrolysis refining of Metals



At cathode : $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$

At anode : $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

These metals are obtained by electrolytic reduction. These metals have more affinity for oxygen than carbon.

Example-Sodium, Magnesium and Calcium..

8. Corrosion & Prevention

Corrosion

Deterioration of a metal when they react with substances like water or air is known as Corrosion.

It causes damage and disintegration of the metal.

$\text{Fe} + \text{O}_2 + \text{H}_2\text{O} \rightarrow \text{Rust Red}$

$\text{Cu} + \text{CO}_2 \text{ \& \ } \text{H}_2\text{O} \rightarrow \text{Bluish green}$

$\text{Ag} + \text{S} \rightarrow \text{AgS (Black)}$

8. Corrosion & Prevention

Prevention

Painting, Oiling, Greasing Galvanization - Is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.

Chrome plating - Is a technique of electroplating a thin layer of chromium onto a metal object.

Anodizing –

Alloying - Is a very good method of improving the properties of a metal corrosion can also be reduced

MCQs

Q1) Which of the following oxides of iron would be obtained on the prolonged reaction of iron with steam?

- a) FeO**
- b) Fe₂O₃**
- c) Fe₃O₄**
- d) Fe₂O₃ and Fe₃O₄**

MCQs

Q2) Aluminium is used for making cooking utensils. Which of the following properties of aluminium are responsible for the same?

- (i) Good thermal conductivity**
 - (ii) Good electrical conductivity**
 - (iii) Ductility**
 - (iv) High melting point**
- a) (i) and (ii)**
 - b) (i) and (iii)**
 - c) (ii) and (iii)**
 - d) (i) and (iv)**

MCQs

Q3) What happens when a pellet of sodium is dropped in water?

- (a) It catches fire and forms oxide**
- (b) It absorbs heat and forms oxide**
- (c) It catches fire and forms hydroxide**
- (d) It absorbs heat and forms hydroxide**

Very Short Answer (2 Mark)

Q4) In nature, aluminium is found in the form of compounds while gold is found in the free state. Give reason.

Very Short Answer (2 Mark)

Q5. Explain why calcium metal after reacting with water starts floating on its surface. Write the chemical equation for the reaction.

Very Short Answer (2 Mark)

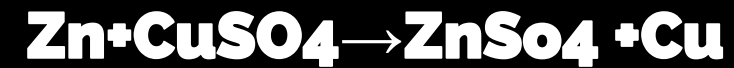
Q6. Ionic compounds conduct electricity in molten state but not in solid state. Why?

Very Short Answer (2 Mark)

Q7) What happens to potassium and sodium if they are kept in open why are they immersed in kerosene oil?

Very Short Answer (2 Mark)

Q8) Reverse of the following chemical reaction is not possible



justify the statement .

Very Short Answer (2 Mark)

Q9) Give reason why copper is used to make hot water tanks and not steel

Very Short Answer (2 Mark)

Q10) State 2 ways of preventing rusting of iron.

Short Answer (3 Mark)

Q11) Give reasons.

(a) Platinum, gold and silver are used to make jewellery.

(b) Sodium, potassium and lithium are stored under oil.

(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.

Short Answer (3 Mark)

Q12) Name the following:

- (a) A non-metal that is lustrous.**
- (b) A metal that is liquid at room temperature.**
- (c) An allotrope of carbon that conducts electricity.**

Short Answer (3 Mark)

Q13) A metal M forms an oxide having the formula M_2O_3 . It is dissolved both in dilute sulphuric and dilute sodium hydroxide solution. Identify the metal & write equations for the reaction involved.

OR

Write chemical reactions that show Al_2O_3 reacts with both acids and base.

Short Answer (3 Mark)

Q14) In the electrolytic refining of M, What would you take as anode, cathode and the electrolyte ?

Short Answer (3 Mark)

Q15) Define the term:

a) Mineral

b) Ore

c) Gangue

Short Answer (3 Mark)

Q16) (a) A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black color product. Identify M and black colored product and explain the reaction of M with oxygen.

(b) Show the formation of aluminium chloride by the transfer of electrons between the atoms. (Atomic number of aluminium and chlorine are 13 and 17 respectively).

Short Answer (3 Mark)

Q17) A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument, the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

Case Based Questions (4 Mark)

Q18) A metal M forms an oxide having the formula M_2O_3 . It dissolves both in dilute hydrochloric acid and dilute sodium hydroxide solution. Identify the metal and write equations for the reactions involved.

**Ans) Reaction: $Cu + H_2O + CO_2 + O_2$
 $\rightarrow Cu(OH)_2 + CuCO_3$**

Case Based Question (4 Mark)

Q19) A metal X combines with a non-metal y by the transfer of electrons to form a compound Z.

- i. State the type of bond in compound Z.**
- ii. What can you say about the melting point and boiling point of compound Z?**
- iii. Will this compound dissolve in kerosene or petrol?**
- iv. Will this compound be a good conductor of electricity?**

Long Answer (5 Mark)

q20) An element E combines with oxygen to form an oxide E_2O which is a good conductor of electricity. Give the following information.

- i. How many electrons will be present in the valence shell of the element E**
- ii. Write the formula of the compound formed when the element E combines with chlorine.**

(b) Atomic no of Mg is 12 and of O is 8. Show the formation of MgO .

(c) Name 2 metals which react with dil. HNO_3 to give H_2 gas.

Try it yourself:

Q1. Name a metal which:

(a) is the best conductor of heat.

(b) has a very low melting point.

(c) does not react with oxygen even at high temperature.

Q2. What is meant by amphoteric oxides?

Choose the amphoteric oxides from the following :

Na₂O, ZnO, CO₂, Al₂O₃, H₂O

Give reason for the following:

(i) Hydrogen gas is not evolved when most of the metals react with nitric acid.

(ii) Zinc oxide is considered as an amphoteric oxide.

(iii) Metals conduct electricity.



DEEKSHA KARNATAKA