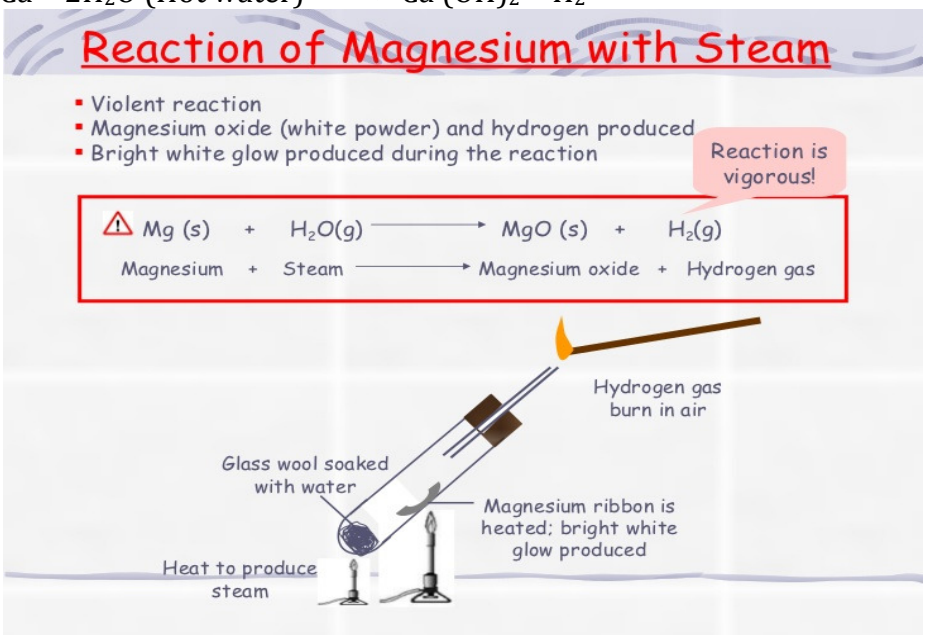
FORMAT FOR LESSON PLAN – SCIENCE			
1.	**Topic**	Metals and Non Metals	
2.	**Logistics**	**No. Of Periods** 8	**Class** 10th
3.	**Objectives**	**General Objectives:** to **comprehend** 1. Remembering : Knowledge-based 2. Understanding: Comprehension 3. Application: Interpretation 4. High order thinking skills: Analysis and Synthesis 5. Evaluation and Multi-Disciplinary 6. Justifying the value of decision or outcome	**Specific Objectives:** to help the students learn and understand • Difference between Metals and Non Metals acc to their physical and chemical property • Use of Metal and Non Metals acc to their properties • Reactivity Series • Reaction between metals and non metals and formation of Ionic Compounds • Extraction of Metals from ores • Corrosion and its prevention • Alloys and its Uses
4.	**Pre – Topic Requirement**	**Book Reading** Page No: 37 to 40 **Previous Knowledge Required** Recall the content studied in class 8th	
5.	**Methodology (General Throughout The Topic)**	• Demonstration method • Practical Method • Real life examples • Picture display • IWB displaying the A-Z chart • Breakup of terminology words • Pupil centered method • Study of periodic table and making charts	
6.	**Terminology**	Metals, Malleability, Ductility, Sonorous, Conductivity, Non metals, Brittle, Ionic compounds, Reactivity Series, Thermite reaction, Allotropy, Anodizing, Minerals, Ores, Gangue, Concentration of Ore, Calcinations, Roasting, electrolytic refining, Corrosion, galvanization, Alloy, Amalgam	

7.	**Day 1**	**Introductory Activity** Take some metal sample (like aluminum foil, copper wire, bicycle bell) and Non metal sample (like pencil lead, coal etc). This activity shows the physical properties of metals and non metals like malleability, ductility, sonorous, conductivity and brittleness.
		Methodology Real life examples, breaking up of methodological words, study of periodic table.
		Teaching Aids required smart-board, chalk Board, periodic chart
		Content Comparative study of Physical properties of Metals and Non metals Comparative study of Physical properties of Metals and Non metals ***Physical properties of metals:*** Solid at room temperature except mercury, Gallium **Malleable:** They can be hammered into very thin sheets called foils. Gold and silver are most malleable. **Ductile:** They can be drawn into wires **Sonorous:** produce sound when stuck **Lustrous:** Natural shine freshly cut **Melting Point:** Have high melting point. Cesium and gallium have very low melting point. **Conductivity:** Generally good conductor of heat and electricity, except lead and mercury which are comparatively poor conductors. Silver and copper are best conductors. **Density:** Have high density. Sodium and potassium can be cut with knife, they have low density. **Physical properties of non-metals:** Occur as **solid** or **gas**. *Bromine is liquid.* Generally **bad conductors** of heat and electricity. **Graphite** a natural form of carbon is a good conductor. **Non-sonorous**. **Non-lustrous**, only **iodine** has luster. Carbon is a non-metal that can exist in different forms. Each form is called an **allotrope.** **Diamond**, an allotrope of carbon, is the hardest natural substance known and has a very high melting and boiling point. **Graphite**, another allotrope of carbon, is a conductor of electricity. Difference b/w metal and nonmetal

		Home Task	**1. Pre Topic Requirement** Memorize Physical properties of Metals and Non metals **2. Reading For Next Day** Page No 41-43
	Day 2	**Introductory Activity** Experiment of Metal with different chemicals in Lab.	
		Methodology Practical Lab Method, breaking up of methodological words, Scientific talk	
		Teaching Aids required chalk Board, lab equipments	
		Content Reaction of Metals with Air and Water *Reaction of Metals with Air and Water* Metals can burn in air, react or don't react with air to form **metal oxides.** Metal + oxygen ------> Metal Oxide Some metals like **Na** and **K** are kept immersed in **kerosene oil** as they react **vigorously with air** and catch fire. Some metals like **Mg, Al, Zn, Pb** react **slowly with air** and form a protective layer. **Mg** can also burn in air with a **white dazzling light** to form its oxide **Fe** and **Cu** don't burn in air but **combine with oxygen** to form oxide. Metals like **silver, platinum and gold don't burn** or react with air. $4Na + O_2$ ------> $2Na_2O$ $2Mg + O_2$ ------> $2MgO$ $2Cu + O_2$ ------> $2CuO$ $4Al + 3O_2$ ------> $2Al_2O_3$ Most of the **metals** combine with **Oxygen** to form **basic metal oxides**. Example: When magnesium burns in oxygen it forms magnesium oxide. $2Mg + O_2 \rightarrow 2MgO$ **Metal oxides** of alkali metals soluble in **water** to form hydroxide solutions, called **alkalies.** Example: Sodium oxide soluble in water to form sodium hydroxide. $Na_2O + H_2O \rightarrow 2NaOH$ Amphoteric Oxides: Metal oxides which react with both acids as well as bases to form

		salt and water e.g. Al_2O_3, ZnO $Al_2O_3 + 6HCl$ ------> $2AlCl_3 + 3H_2O$ $Al_2O_3 + 2NaOH$ ------> $2NaAlO_2 + H_2O$ *Reaction with water:* In general **metals** react with **water** to form a **metal oxide** or **hydroxide** and **hydrogen gas**. $Na + H_2O$ (cold water) ------> $NaOH + H_2$ + heat energy $K + H_2O$ (cold water) ------> $KOH + H_2$ + heat energy The reaction is so **violent** that the evolved **hydrogen** immediately **catches fire** so they are stored in **kerosene**. $Ca + 2H_2O$ (Hot water) ------> $Ca(OH)_2 + H_2$ 	
		Home Task	**1. Pre Topic Requirement** Written practice of chemical reaction b/w Metal & Air, Metal & Water **2. Reading For Next Day** Page No 43-45
	Day 3	**Introductory Activity** Experiment of Metal with different Acids and solution of other Metal salts.	
		Methodology Practical Lab Method, breaking up of methodological words, Scientific talk	
		Teaching Aids required chalk Board, lab equipments	
		Content Reaction of Metals with Acid and different salt solution. *Reaction of Metals with Acid and different salt solution.*	

Reaction with dilute acids:

Metals react with dilute **hydrochloric acid** and dilute sulphuric acid to form **salt** and **hydrogen gas.**

$Fe + 2HCl \text{ ------> } FeCl_2 + H_2$

Acid + Metal

- Acid + Metal → Salt + Hydrogen Gas
- Nitric Acid + magnesium → magnesium nitrate + hydrogen gas
- We test for hydrogen gas by doing the POP test

$Zn + 2HCl \text{ ------> } ZnCl_2 + H_2$

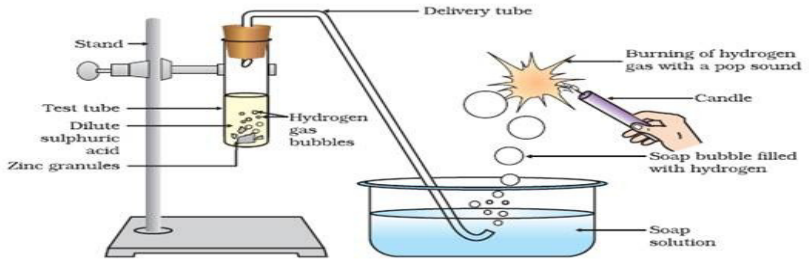


Figure 2.1 Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning

Copper, mercury and **silver don't** react with dilute **acids** as they cannot displace hydrogen from acids as they are **less reactive** than hydrogen.

Hydrogen gas is not evolved when a metal reacts with nitric acid (HNO_3).

Metal generally cannot react with **nitric acid** as it is a **strong oxidizing agent.** Hydrogen gas produced is oxidised to water when metals react with nitric acid.

But **Mg** and **Mn**, react with very dilute nitric acid to evolve hydrogen gas.

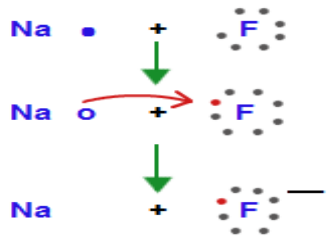
$Mg + 2HNO_3 \text{ ------> } Mg(NO_3)_2 + H_2$

$Mn(s) + 2HNO_3\ (aq) \rightarrow Mn(NO_3)_2 + H_2$

Aqua regia is a mixture of concentrated **hydrochloric acid** and concentrated **nitric acid** in the ratio of **3:1**. It can dissolve gold, even though neither of these acids can do so alone. Aqua regia is a corrosive, fuming liquid. It is one of the few reagents that is able to dissolve gold and platinum.

Reaction of metals with other metal salts:

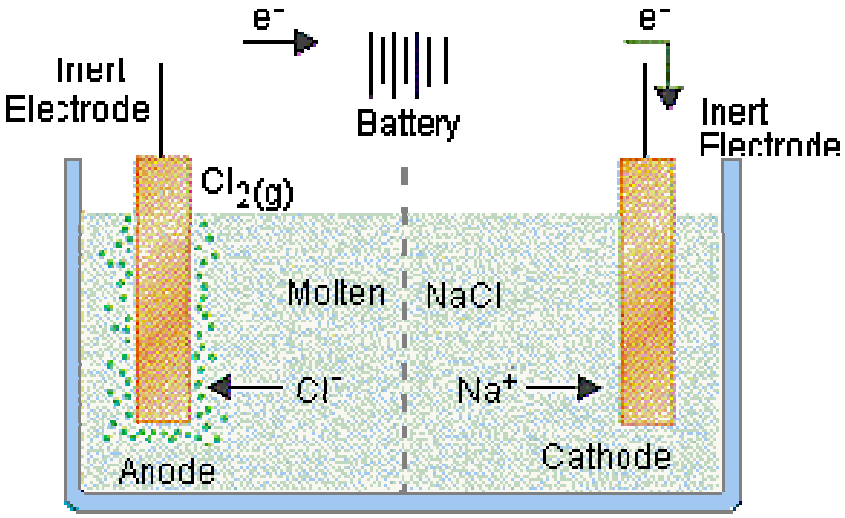
All metals are not equally reactive. Reactive metals can displace

		less reactive metals from their compounds in solution. This forms the basis of reactivity series of metals. A metal can displace all metals from their compound which are below or after it in this series. $Fe + CuSO_4 \text{ ---------> } FeSO_4 + Cu$ $Zn + CuSO_4 \text{ --------> } ZnSO_4 + Cu$	
		Home Task	**1. Pre Topic Requirement** Written practice of chemical reaction b/w Metal & Acid, Metal & Salt sol **2. Reading For Next Day** Page No 45-48
	Day 4	**Introductory Activity** Arrange Metals acc to Reactivity series	
		Methodology Chart paper Method, breaking up of methodological words	
		Teaching Aids required IWB Display	
		Content Reaction of Metals and Non Metals *Reaction of Metals and Non Metals* – Reactivity of elements can be understood as a tendency to attain a completely filled valence shell. – Atom of metals can lose electrons from valence shells to form cations (+ve ions). – Atom of non-metals gain electrons in valence shell to form anions (–ve ions). – Oppositely charged ions attract each other and are held by strong electrostatic forces of attraction forming ionic compounds. Formation of an Ionic Compound sodium Fluoride, NaF  Reaction of metal and non-metal **Properties of Ionic Compounds:** – Are solid and mostly brittle. – Have high melting and boiling points. More energy is required to break the strong inter-ionic attraction. – Generally soluble in water and insoluble in kerosene, petrol.	

		– Conduct electricity in solution and in molten state. In both cases, free ions are formed and conduct electricity.	
		Home Task	**1. Pre Topic Requirement** Do practice Lewis dot structure of reaction b/w Metals and non metals **2. Reading For Next Day** Page No 48-51
	Day 5	**Introductory Activity** Steps involved in the extraction of Metals	
		Methodology Picture display, breaking up of methodological words, group discussion, Chart making	
		Teaching Aids required chalk Board, flow chart	
		Content Extraction of Metal having low and moderate reactivity. ***Extraction of Metal having low and moderate reactivity*** **Occurrence of Metals** Minerals: elements of compounds occurring naturally are minerals. **Ores:** Mineral from which metal can be profitably extracted is an ore. For example, Sulphide ore, oxide ore, carbonate ore. **Metallurgy:** The process of obtaining metal from its ore. They are: (i) Enrichment of ore after crushing and grinding (ii) Obtaining metal from enriched ore. (iii) Refining of impure metal to obtain pure metal. **Enrichment of ore after crushing and grinding:** At first the ore is crushed to powder. The fine particles of ore is separated by physical processes like hydraulic washing, froth-floatation, and magnetic separation or by chemical processes, depending on the nature of the ore and its impurities **Metals at the bottom of activity series** like gold, platinum, and silver, copper generally occur in Free State. But copper and silver also occur in sulphide and oxide ores. Mercury from cinnabar $2HgS + 3O_2$ ---Heat--> $2HgO + 2SO_2$ $2HgO$ ------Heat----> $2Hg + O_2$ **Metals of medium reactivity** (Zn, Fe, Pb etc.) occur mainly as oxides, sulphides or carbonates. Metals are easier to obtain from oxide ores, thus, sulphide and carbonate ores are converted into oxides. Metal ore heated strongly in excess of air is called Roasting	

		$2ZnS + 3O_2$ ------Heat----> $2ZnO + 2SO_2$ Metal ore heated strongly in limited or no supply of air (Calcination) $ZnCO_3$ ------Heat----> ZnO + CO2 **Reduction of Metal Oxide**: It is easier to obtain a metal from its oxide, as compared to its sulphides and carbonates. Therefore, the metal sulphides and carbonates must be converted into metal oxides 1. USING COKE: Coke as a reducing agent as it is cheap. ZnO + C ------Heat----> Zn + CO **USING DISPLACEMENT REACTION:** Highly reactive metal like Na, Ca and Al are used to displace metals of lower reactivity from their compounds. $MnO_2 + 4Al$ ------Heat----> $3Mn + 2Al_2O_3$ + heat $Fe_2O_3 + 2Al$ ------Heat----> $2Fe + Al_2O_3$ + heat Displacement reactions are highly exothermic. The amount of heat evolved is so large that the metals are produced in the molten state Therefore molten iron so formed and is used to join railway tracks. This is called **Thermite** reaction.	
		Home Task	**1. Pre Topic Requirement** Do practice of the reaction involved in the extraction of metals **2. Reading For Next Day** Page No 51-52
	Day 6	**Introductory Activity** Electrolytic refining of sodium and other Metals	
		Methodology Practical Lab Method, breaking up of methodological words, Pupil centered method, reactivity series	
		Teaching Aids required smart board, chalk board, lab equipments	
		Content Extraction of metals high up in the activity series and Refining *Extraction of metals high up in the activity series and Refining* **Metals of high reactivity** (K, Na, Ca, Mg and Al) are very reactive and thus found in combined state. **Extracting Metals at the Top of Activity Series:** These metals have more affinity for oxygen than carbon. These metals therefore are obtained by electrolytic reduction from	

their salt.



Sodium is obtained by electrolysis of its molten chloride

$NaCl \rightarrow Na^{+1} + Cl^{-1}$

As electricity is passed through the solution metal gets deposited at cathode and non-metal at anode.

At cathode (the negatively charged electrode):

$Na^{+1} + e- \text{-----} > Na$ at anode (the positively charged electrode). :

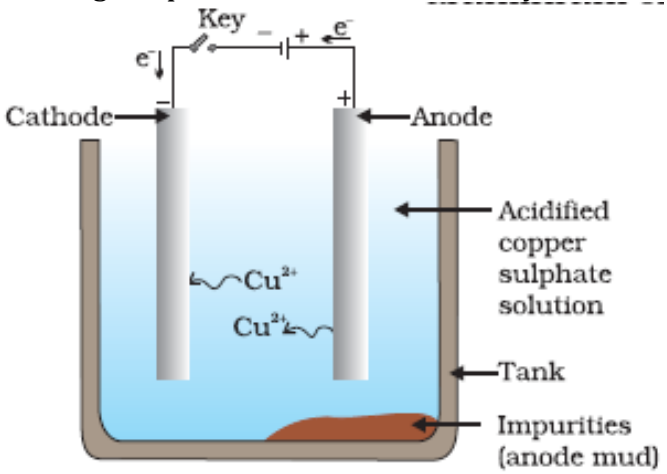
$2Cl^{-1} \text{----------} > Cl_2 + 2e-$

Refining of Metals:

Impurities present in the obtained metal can be removed by electrolytic refining.

Copper is obtained using this method.

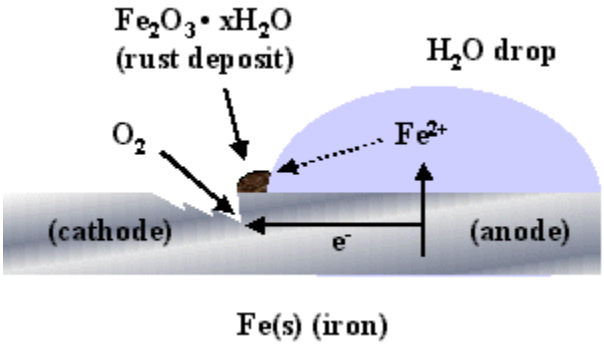
Following are present inside the electrolytic tank.



Anode – slab of impure copper

Cathode – slab of pure copper

Solution – aqueous solution of copper sulphate with some dilute

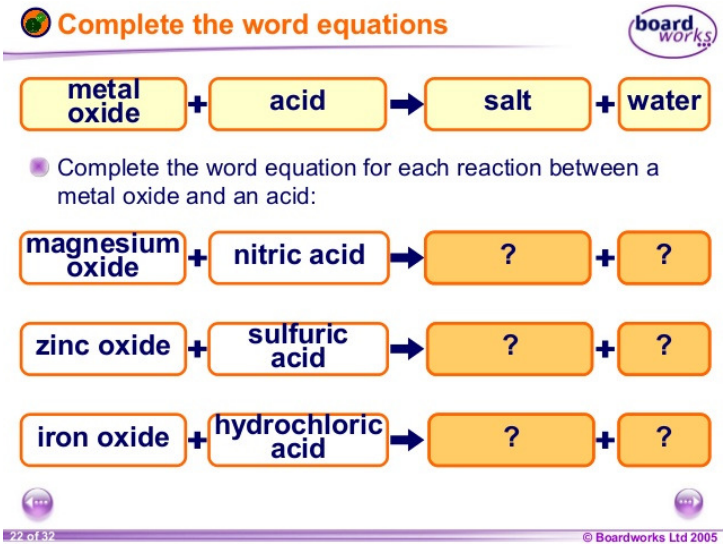
		sulphuric acid On passing electricity through electrolytes, from anode copper ions are released in the solution and equivalent amount of copper from solution is deposited at cathode. Impurities containing silver and gold get deposited at the bottom of anode as anode mud	
		Home Task	**1. Pre Topic Requirement** Do practice of all reactions involve in the extraction and refining **2. Reading For Next Day** page no 53-54
	Day 7	**Introductory Activity** Investigating condition necessary for Rusting	
		Methodology Activity method, breaking up of methodological words, group discussion	
		Teaching Aids required lab equipments, smart board, chalk board	
		Content Corrosion and its Prevention *Corrosion and its Prevention* **Corrosion:** – **Metals** are **attacked** by substances in surroundings like **moisture** and **acids**. – **Silver** - it reacts with sulphur in air to form **silver sulphide** and articles become **black**. – **Copper** - reacts with **moist carbon dioxide** in air and gains a **green** coat of **copper carbonate**. – **Iron**-acquires a coating of a **brown flaky** substance called **rust**. Both **air** and **moisture** are necessary for rusting of iron. $4Fe + 3O_2 + 2xH_2O \rightarrow 2Fe_2O_3.xH_2O$  Sometimes rusting is **advantageous** as it **prevents** the metal	

		underneath from **further damage**. e.g. On exposure to air, the surface of **aluminum** is coated with a thin layer of **aluminum oxide** **Prevention of corrosion:** – Rusting of iron is prevented by painting, oiling, greasing, galvanizing, chrome plating, anodizing and making alloys. – In galvanization, iron or steel is coated with a layer of zinc because zinc is preferably oxidized than iron.	
		Home Task	**1. Pre Topic Requirement** Make question Bank **2. Reading For Next Day** Do back exercise on page no 56-57
	Day 8	**Introductory Activity** Group discussion	
		Methodology Real life examples, Picture display, IWB displaying the A-Z chart, Breakup of terminology words, Pupil centered method	
		Teaching Aids required smart board, chalk board	
		Content Alloy and Revision of terminology and reactions *Alloys, Revision of terminology and reactions* **Alloys:** These are mixture of metals with metals or non-metals –Adding small amount of **carbon** makes **iron hard** and **strong.** –**Stainless steel** is obtained by mixing **iron** with **nickel** and **chromium.** It is hard and doesn't rust. –**Mercury** is added to other metals to make **amalgam.** –**Brass**: alloy of copper and zinc. –**Bronze**: alloy of copper and tin. –**Solder:** alloy of lead and tin has low melting point and is used for welding electrical wires –Melting point and electrical conductivity is lower than that of pure metal.	

Table 3: Reaction of Metals with dilute hydrochloric acid

Metal	Observations/Equations
Potassium Sodium	Explosive reaction Should not be carried out in school laboratory $2K(s) + 2HCl(aq) \longrightarrow 2KCl(aq) + H_2(g)$ $2Na(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2(g)$
Calcium	Reacts violently to give hydrogen and calcium chloride $Ca(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2(g)$
Magnesium	Reacts rapidly to give hydrogen and magnesium chloride $Mg(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2(g)$
Zinc	Reacts moderately fast to give hydrogen and zinc chloride $Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$
Iron	Reacts very slowly to produce hydrogen and iron (II) chloride $Fe(s) + 2HCl(aq) \longrightarrow FeCl_2(aq) + H_2(g)$
Lead Copper Silver	No reaction occurs

Reactivity of metals increase up the series; metals on top of the series reacted more readily and violently with dilute acids



Home Task	1. Pre Topic Requirement Written test

And So On

8.	Rubrics of	

	activities	
9.	**Suggestive Periodic Activities**	
10.	**Concept Based Questions**	1) Gold is a very precious metal. Pure gold is very soft it is therefore not suitable for making jewelery. It is alloyed with either Silver or Copper to make it hard. But sometimes jewelers mix a large quantity of copper and Silver in gold to earn more profit. a) What precautions should you take while purchasing gold jewellery? b) Why does Government insist on purchasing Hall Marked jewellery? 2) Corrosion is a serious problem. Every year an enormous amount of money is spend to replace damaged iron. What steps can be taken to prevent this damage. 3) Mercury is the only metal found in the liquid state. It is largely used in thermometers to measure the temperature. But mercury is a very dangerous metal as its density is very high. What two precautions you would take while handling the equipments containing Mercury?
11.	**HOTS questions**	**HOTS** 1. A metal acts as a good reducing agent. It reduces Fe_2O_3, and MnO_2. The reaction with Fe_2O_3 is used for welding broken railway tracks. Identify the metal and write all the chemical reactions 2. A yellow coloured powder `X` is soluble in carbon disulfide. It burns with a blue flame forming suffocating smelling gas which turns moist blue litmus red. Identify `X` and gives chemical reaction. Identify it is metal or nonmetal. 3. An element reacts with oxygen to form an oxide which dissolves in dilutehydrochloric acid. The oxide formed also turns a solution of red litmus blue. Is the element a metal or non-metal? Explain with the help of a suitable example.

		4. Nikita took Zn, Al, Cu, Fe, Mg, Na metals & put each metal in cold water and then hot water. She reacted the metal with steam (i) Name the metal which reacts with cold water. (ii) Which of the above metals react with steam? (iii) Name the metal which reacts with hot water. (iv) Arrange these metals in order of increasing reactivity. 5. A student was given Mg, Zn, Fe, and Cu metals. He put each of them in dil HCl contained in different test tubes. Identify which of them (i) will not displace H2 from dil HCl (ii) forms a pale green substance (iii) will give H2 with 5% HNO3 (iv) will be displaced from its salt solution by all other metals.
12.	**MCQs related to the topic**	1. Alloys are homogeneous mixtures of a metal with a metal or nonmetal. Which among the following alloys contain non-metal as one of its constituents? a. Brass b. Bronze c. Amalgam d. Steel **Answer:** (d) Steel 2. Which among the following statements is incorrect for magnesium metal? a. It burns in oxygen with a dazzling white flame b. It reacts with cold water to form magnesium oxide and evolves hydrogen gas c. It reacts with hot water to form magnesium hydroxide and evolves hydrogen gas d. It reacts with steam to form magnesium hydroxide and evolves hydrogen gas **Answer:** (b) It reacts with cold water to form magnesium oxide and evolves hydrogen gas 3. An element A is soft and can be cut with a knife. This is

very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following

a. Mg
b. Na
c. P
d. Ca

Answer: (b) Na

4. During electrolytic refining of zinc, it gets

a. deposited on cathode
b. deposited on anode
c. deposited on cathode as well as anode
d. remains in the solution

Answer: (a) Deposited on cathode

5. An electrolytic cell consists of

i. positively charged cathode
ii. negatively charged anode
iii. positively charged anode
iv. negatively charged cathode

a. (i) and (ii)
b. (iii) and (iv)
c. (i) and (iii)
d. (ii) ad (iv)

Answer: (b) (iii) and (iv)

6. An alloy is

a. an element
b. a compound
c. a homogeneous mixture
d. a heterogeneous mixture

Answer: (c) A homogeneous mixture

7. 2 mL each of concentrated HCl, HNO_3 and a mixture of concentrated HCl and concentrated HNO_3 in the ratio of 3 : 1 were taken in test tubes labelled as A, B and C. A small piece of metal was put in each test tube. No change

occurred in test tubes A and B but the metal got dissolved in test tube C respectively. The metal could be

a. Al
b. Au
c. Cu
d. Pt

Answer: (b) Au

8. Which one of the following four metals would be displaced from the solution of its salts by other three metals?

    a. Mg
    b. Ag
    c. Zn
    d. Cu

Answer: (b) Ag

9. Generally, non-metals are not lustrous. Which of the following nonmetal is lustrous?

    a. Sulphur
    b. Oxygen
    c. Nitrogen
    d. Iodine

    Answer: (d) Iodine

10. Which among the following alloys contain mercury as one of its constituents?

    a. Stainless steel
    b. Alnico
    c. Solder
    d. Zinc amalgam

    Answer: (d) Zinc amalgam

11. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the

following properties is not shown by Z?

a. Has high melting point
b. Has low melting point
c. Conducts electricity in molten state
d. Occurs as solid

Answer: (b) Has low melting point

12. The electronic configurations of three elements X, Y and Z are X — 2, 8; Y — 2, 8, 7 and Z — 2, 8, 2. Which of the following is correct?

A. X is a metal
B. Y is a metal
C. Z is a non-metal
D. Y is a non-metal and Z is a metal

Answer: (D) Y is a non-metal and Z is a metal

13. Although metals form basic oxides, which of the following metals form an amphoteric oxide?

e. Na
f. Ca
g. Al
h. Cu

Answer: (g) Al

14. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity?

i. Diamond
j. Graphite
k. Sulphur
l. Fullerene

Answer: (b) Graphite

15. Electrical wires have a coating of an insulting

		material. The material, generally used is a. Sulphur b. Graphite c. PVC d. All can be used **Answer:** (c) PVC 16. Which of the following non-metals is a liquid? e. Carbon f. Bromine g. Phosphorus h. Sulphur **Answer:** (b) Bromine 17. Which of the following can undergo a chemical reaction? a. $MgSO_4$ + Fe b. $ZnSO_4$ + Fe c. $MgSO_4$ + Pb d. $CuSO_4$ + Fe **Answer:** (d) $CuSO_4$ + Fe
13.	**Lab work**	• Show the reactivity of different metal with acid • Perform an activity to show necessary conditions for rusting of iron • Make a circuit using metal or non metal to show their conductivity • Perform an experiment to show metal oxides are basic in nature
14.	**Numerical**	**NA**
15.	**Remedial Measure For Low Achievers**	1. List five physical properties of metals and compare them with non-metals. 2. Why is gold widely used for making jewellery? 3. Name one metal commonly used for making cooking utensils. Give reason also.

		4. Give exceptions in the following cases a. All metals exist as solid at room temperature. b. Non-metals are non-lustrous. c. Non-metals do not conduct electricity. d. Metals are hard. e. Solid non-metals are brittle. 5. What is observed when Magnesium ribbon is burnt in a flame. (b) Copper metal is heated in air. 6. Name two metal oxides that are soluble in water. (Write equation also) 7. with the help of equations, show that Al2O3 is an amphoteric oxide. 8. Write equations for the reactions of an acid with: a. Zn metal. (b) Na2CO3 (c) NaHCO3 (d) NaOH solution. 9. Why is there no evolution of hydrogen when nitric oxide reacts with metals? 10. What is the reactivity series of metals? 11. What is an electrovalent bond? 12. Why does a solution of sodium chloride conduct electricity which solid NaCl does not? 13. Write properties of ionic compounds. 14. Differentiate between a mineral and an ore. 15. Give reasons: a. Gold and silver are found in their free state. b. Sodium is never found in its free state. c. The sulphide ore is converted into an oxide for the extraction of metals. d. The oxides of metals like Hg can be reduced by heating only. e. The oxides of metals like Na, Mg, and Ca cannot be reduced by carbon 16. Name two metals that can be refined by electrolysis. 17. Name the cathode, anode and the electrolyte for refining of copper electrolytically. 18. Name the substance formed on the surface of iron, silver and copper due to corrosion. 19. How is steel different from stainless steel? 20. What is an alloy? Write the composition of brass, bronze and solder. **A. Fill in the blanks.**

		1. Some metals like _____ and _____ are poor conductors of heat. 2. The shining surface of the metals may become dull due to the formation of _____ layer. 3. Silver foil is used to cover Indian sweets because it is highly _____ and can be beaten into very thin sheets. 4. Diamond is a non-metal but still the _____ natural substance known. 5. The gas released when a metal reacts with an acid is _____. **B. Analogy type questions .** 1. Metal : Basic oxide :: Non-metal : _____ 2. Reactive metal (Na) : Electrolytic reduction :: Medium reactive metal (Zn) : _____ 3. Sodium : Soft :: Iron : _____ 4. Drawn into wires : Ductile :: Beaten to thin Sheets : _____ 5. Copper : No reaction even with steam :: Sodium : _____ **C. Answer the following questions .** 1. What happens when Hydrochloric Acid reacts with metals? 2. Zinc oxide is considered as an amphoteric oxide. Give Reasons. 3. Non-metals form acidic oxides whereas metals form basic oxides. Justify the statement. **Answers** 1) lusture mallebility ductility sonorous conductivity 2) most ductile 3) copper because good conductor of heat 4) a) mercury b) iodine c) graphite d) sodium e) diamond 5) a) white dazzling flame b) black colour copper oxide will form

6) NaOH ,KOH

7) Al_2O_3 +6HCl → $2AlCl_3 + 3H_2O$
Al_2O_3 +2NaOH → $2NaAlO_2 + H_2O$

8) Zn +2HCl → $ZnCl_2 + H_2$
HCl + Na_2CO_3 → NaCl +H_2O + CO_2
HCl + $NaHCO_3$ → NaCl + H_2O + CO_2
HCl + NaOH → NaCl + H_2O

9) Strong oxidizing agent oxidize hydrogen into water
10) arrangement of metal acc to their decreasing reactivity
11) bond form due to transfer of electron
12) because presence of free ion in solution but in solid form ions are not free
13) Properties of ionic compounds:
- Are solid and mostly brittle.
- Have high melting and boiling points. more energy is required to break the strong inter-ionic attraction.
- Generally soluble in water and insoluble in kerosene, petrol.
- Conduct electricity in solution and in molten state. in both cases, free ions are formed and conduct electricity.

14) mineral are the element or compound which found under the earth with some earthy impurity ex iron oxide ,iron sulphide etc
Ore are the mineral from which metal can extract profitably
15)
a) These metals are less reactive in nature.
b) These metals are highly reactive in nature.
c) Because it is easy to extract metal from oxide ore than sulphide ore
d) Because Hg is less reactive in nature.
e) Because carbon is less reactive than these metals and cannot displace it.

16) sodium and potassium
17) Cathode - Pure Copper
Anode - Impure Copper
Solution - Copper sulphate
18)
- Metals are attacked by substances in surroundings like moisture and acids.
- Silver - it reacts with sulphur in air to form silver sulphide and articles become black.
- Copper - reacts with moist carbon dioxide in air and gains a green coat of copper carbonate.
- Iron-acquires a coating of a brown flaky substance called rust. both air and moisture are necessary for rusting of iron.

19) In steel carbon is mixed into Iron
In stainless steel nickel and chromium added into Iron

20) Alloys:
These are mixture of metals with metals or non-metals

- Adding small amount of carbon makes iron hard and strong.
- Stainless steel is obtained by mixing iron with nickel and chromium. it is hard and doesn't rust.
- Mercury is added to other metals to make amalgam.

✓ Brass: alloy of copper and zinc.
✓ Bronze: alloy of copper and tin.
✓ solder: alloy of lead and tin has low melting point and is used for welding electrical wires

Revision worksheet
FILL IN BLANKS

1.
i) Bismuth and tungsten
ii) Oxide and carbonate
iii) Malleable
iv) Hardest
v) Hydrogen gas

2.
i) Acidic
ii) Smelting
iii) Hard
iv) Malleable
v) Even react with cold water

3.
i) When metal react with HCl acid metal chloride and hydrogen gas will form
$Fe + 2HCl \text{ ------> } FeCl_2 + H_2$

ii) Metal oxides which react with both acids as well as bases to form salt and water e.g. Al_2O_3, ZnO
$Al_2O_3 + 6HCl \text{ ------> } 2AlCl_3 + 3H_2O$
$Al_2O_3 + 2NaOH \text{ ------> } 2NaAlO_2 + H_2O$

iii) Metal form basic oxide because when metal oxide dissolves in water metal hydroxide is formed and in case of nonmetal oxide acid will formed.
$MgO + H_2O \text{----------} \rightarrow Mg(OH)_2$ basic hydroxide
$SO_2 + H_2O \text{----------} \rightarrow H_2SO_3$ acidic oxide

16.	**Worksheets for revision and practice**	**Question 1. Which of the following pairs will give displacement reactions?** **(a) NaCl solution and copper metal** **(b) $MgCl_2$ solution and aluminium metal** **(c) $FeSO_4$ solution and silver metal** **(d) $AgNO_3$ solution and copper metal.** **Question 2. Which of the following methods is suitable for preventing an iron frying pan from rusting?** **(a) Applying grease** **(b) Applying paint** **(c) Applying a coating of zinc** **(d) All of the above.** **Question 3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be** **(a) calcium** **(b) carbon** **(c) silicon** **(d) iron.** **Question 4. Food cans are coated with tin and not with zinc because** **(a) zinc is costlier than tin.** **(b) zinc has a higher melting point than tin.** **(c) zinc is more reactive than tin.** **(d) zinc is less reactive than tin.** **Question 5. You are given a hammer, a battery, a bulb, wires and a switch.** **(a) How could you use them to distinguish between samples of metals and non-metals?** **(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.** **Question 6. What are amphoteric oxides? Give two examples of amphoteric oxides.** **Question 7. Name two metals which will displace hydrogen from dilute acids, and two metals which will not.** **Question 8. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?** **Question 9. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube**

		over it, as shown in figure below. **(a) What will be the action of gas on** **(i) dry litmus paper?** **(ii) moist litmus paper?** **(b) Write a balanced chemical equation for the reaction taking place.** **Question 10. State two ways to prevent the rusting of iron.** **Question11. What type of oxides are formed when non-metals combine with oxygen?** **Question 12. 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.** **(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.** **Question 13. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.** **Question 14. Differentiate between metal and non-metal on the basis of their chemical properties.** **Question 15. 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?** **Question 16. Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron) is not.** **Question 17. What happens when iron is heated to a high temperature.** **Question 18. What happens when copper is heated to a very high temperature.** **Question 19. Write an experiment to show that copper does not react with dilute HCl and H_2So_4.**

Question 20. Write the physical properties of metals.

Answer1. (d) AgNO3 solution and copper metal.

Answer2.(c) Applying a coating of zinc

Answer3.(a) Calcium

Answer4.(c) zinc is more reactive than tin.

Answer5. We have learnt that Metals are lustrous, malleable, ductile and are good conductors of heat and electricity. They are solids at room temperature, except mercury which is a liquid. Non-metals have properties opposite to that of metals. They are neither malleable nor ductile. They are bad conductors of heat and electricity, except for graphite, which conducts electricity.
(a) Here to distinguish between samples of metals and non-metals using hammer first, we will hammer the given samples of metals and non-metals one by one. We know some metals can be beaten into thin sheets. This property is called malleability. For example gold and silver are the most malleable metals. The samples which, can be converted into thin sheets on hammering hence, are metal where as Non-metal are brittle and can not be beaten into thin sheets.
Secondly, to distinguish between samples of metals and non-metals using a battery, a bulb, wires and a switch we can make use of a property of metal whereby they conduct electric current. To do this, we will arrange the things given a battery, a bulb, wires and a switch and test sample, as shown in the figure below :

The given test sample is connected in searies, and when we turn on the switch, if the bulb glow, given sample is Metal if it does not glow then it is a Non-metal.
(b)The method above is pretty useful except for graphite which despite being a Non-metal is good conductor of electricity.

Answer6. We know that Metals combine with oxygen to form basic oxides. In general, most of the metal oxide are basic in nature. But some metal
oxides, such as aluminium oxide, zinc oxide, etc., show both acidic as well as basic behaviour. Such metal oxides which react with both acids as
well as bases to produce salts and water are known as amphoteric oxides.
Example (i) Aluminium oxide reacts in the following manner with acids and bases –
$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

		$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$ (Sodium aluminate) Example (ii) Similiarly Zinc Oxides, Lead Oxide are amphoteric oxides which react with both acids as well as bases to produce salts and water **Answer7.** (i) Two metals which will displace hydrogen from dilute acids are - Magnesium and Aluminium (i) Two metals which will not displace hydrogen from dilute acids are - Gold and Copper **Answer8.** In this process, the impure metal is made the anode and a thin strip of pure metal is made the cathode. A solution of the metal salt is used as an electrolyte. The apparatus is set up as shown in Figure. On passing the current through the electrolyte, the pure metal from the anode dissolves into the electrolyte. An equivalent amount of pure metal from the electrolyte is deposited on the cathode. The soluble impurities go into the solution, whereas, the insoluble impurities settle down at the bottom of the anode and are known as anode mud. **Electrolytic refining of copper**. *The electrolyte is a solution of acidified copper sulphate. The anode is impure copper, whereas, the cathode is a strip of pure copper. On passing electric current, pure copper is deposited on the cathode.* **Answer.9** (a) (i) The gas will not have any effect on dry litmus. (ii) The gas will turn blue litmus red in moist state. (b) $S + O_2 \rightarrow SO_2$ **Answer10.** Two ways two ways to prevent the rusting of iron. **(i) Galvanization**: In this method, for preventing the rusting of iron and steel, they are coated with a thin layer of a Zinc. The galvanised iron article is protected against rusting as layer of zinc isolate the iron surface with moist air hence prevent rusting or corssion due to oxidisation.. **(i) Painting** : In this method, for preventing the rusting of iron and steel, they are coated with a thin layer of a paint. The painted iron article is protected against rusting as layer of paint isolate the iron surface with moist air hence prevent rusting or corssion due to oxidisation. The galvanised article is protected against rusting even if the zinc coating is broken.

		Answer11. When non-metals combine with oxygen, they form either acidic oxide or neutral oxide **Answer:** 12 (a) Platinum, gold and silver are used to make jewellery becuase they are very less. (b) Metals such as potassium and sodium react so vigorously that they catch fire if kept in the open.Hence, to protect them and to prevent accidental fires, they are kept immersed in kerosene oil. (c) Aluminium does not corrode and is a very good conductor of heat. (d) It is easier to obtain a metal from it oxide, as compared to its sulphides and carbonates. Therefore, prior to reduction, the metal sulphides and carbonates must be converted into metal oxides. **Answer13.** Copper oxide reacts with acids but copper itself does not react. So the copper can be washed by acidic subtances. It removes the corroded part (copper oxide) and pure copper is left behind. **Answer:14** **(i) Iron formation:** Metals from positive ions and non-metals form negative ions. **(ii) Acidic nature:** Metals form basic oxides and non-metals form acidic oxide. **(iii) Reaction with water:** Metals react with water but non-metals do not. **Answer15.** The solution, he used was aqua regia. **Answer16.** Hot iron reacts with steam formed by boiling water. But, copper does not react with water. **Answer17.** Iron does not burn on heating but glows brightly. **Answer18** Copper does not burn, but the hot metal is coated with a layer of black substance known as copper(II) oxide. **Answer.19** The small piece of magnesium, zinc, aluminium, iron and copper. Clean their surfaces by rubbing with a sand paper. Place these metals in separate test tubes. Add about 10 mL dilute hydrochloric acid to each of these test tubes. Observe carefully the rate of formation of bubbles. We will find that the rate of formation of bubbles was the fastest in the case of magnesium.It decreases in the order Mg > Al > Zn > Fe. In the case of copper does not react with dilute HcI and H_2SO_O **Answer:20** (i) All metals except mercury are solid at room temperature.

		(ii) Metals possess metallic luster. (iii) They are malleable and and ductile. (iv) They are good conductor of heat and electricity (v) They (except sodium) are sonorous and have high density. (vi) They are generally hard except sodium and potassium. (vii) Metals have high boiling and melting points except sodium and potassium.
17.	**Evaluation**	