Materials: Metals and Non- Metals

Very Short Q&A:

Q1: All metals are good conductor of _____ and _____.

Ans: Heat and electricity

Q2: When we beat the aluminium wire its shape changed, which property of metals is shown by this?

Ans: Property of malleability of metals.

Q3: When we beat a coal its shape do not changed, rather is break down into small pieces, why so?

Ans: Because coal is non-metal and it is not malleable.

Q4: Give examples of some metals and non-metals.

Ans:

- Examples of metals: iron, magnesium, copper, calcium etc.
- Examples of non-metals: sulphur, carbon, phosphorus, oxygen etc.

Q5: Non- metals are bad conductor of electricity. Give example to support this statement.

Ans: Handles of metallic pan or other cookwares are made of wood or plastics which are non-metal and bad conductor of electricity.

Q6: Which of the following are good conductor of electricity and which one is bad conductor?

a. **An iron pan**
b. **an aluminium utensil**
c. **wood**
d. **plastic handle of a pan**
e. **nail**

Ans: Good conductor: An iron pan, an aluminium utensil and nail

Bad Conductor: wood and plastic handle of a pan

Q7: Why we can see wires of aluminium and copper but not of coal or wood?

Ans: Because wires of aluminium and coppers are made on the basis of property of metals called ductile, since wood and coal are non-metals and they dont show this property so it is not possible to make wires of these materials.

Q8: Why bells in temples are made up of metal?

Ans: Because metals produce ringing sounds are are said to be sonorous.

Q9: Which of the two will produce ringing sound a metallic box or a wooden box?

Ans: a metallic box

Q10: What is sonorous?

Ans: Metals are called sonorous because they produce ringing sounds.

Q11: Define ductility.

Ans: Ductility is the property of metal by which it can be made into thin wires.

Q12: Define malleability.

Ans: The property of metals by which it can be can be made into thin sheets is called malleability.

Q13: Sulphur is ductile or not?

Ans: No

Q14: Which one of the two is malleable oxygen or calcium?

Ans: Calcium

Q15: Name the metal which is found in liquid state at room temperature?

Ans: Mercury

Q16: Name the metal which is soft and can be cut easily with a knife.

Ans: sodium and potassium

Q17: Which of the two is malleable, phosphorus or iron?

Ans: Iron

Q18: Metals like gold, silver, platinum etc. retain their lustre because they do not react with air, water or _____

Ans: Acids

Q19: What do you mean by noble metals?

Ans: Metals like gold, silver, platinum etc. retain their lustre because they do not react with air, water or acids, thus they are called noble metals.

Q20: Why 24 carat gold is mixed with some silver or copper to make ornaments?

Ans: 24 carat gold is very soft and cannot be used for making ornaments, thus it is mixed with some silver or copper to make it hard.

Q21: Metal reacts with oxygen to form_____

Ans: Metallic oxides

Q22: Tick the wright answer.

Metal reacts with water to form

a. **Oxide**
b. **Chloride**
c. **Hydroxide**
d. **None of these**

Ans: Hydroxides

Q23: Complete the following reaction of magnesium and oxygen

2 Mg + O2 ---> _____
MgO+ H2O ---> _____

Ans: 2 Mg + O2? 2 MgO

MgO+ H2O-> Mg(OH) 2

Q24: Give example of this: Metals react with water to form metal hydroxides and hydrogen. Write the equation for this reaction.

Ans: E.g. Sodium reacts with water to form sodium hydroxide and hydrogen.

2 Na + 2 H2O 2 NaOH + H2

Q25: Complete the following equation:

Zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen.
Zn + 2 HCl ---> _____ + H2

Ans: Zn + 2 HCl ----> ZnCl2+ H2

Q26: Complete the following displacement reaction:

Copper sulphate + _____ -----> Zinc sulphate + _____

Ans: Copper sulphate + zinc -----> Zinc sulphate + copper

Q27: State whether true of false

A less reactive metal can replace a more reactive metal, but a more reactive metal cannot replace a less reactive metal.

Ans: False

Q28: State the uses of iron.

Ans: Iron is used for making pins, nails, nuts, bolts, tools, and various parts of machineries.

Q29: Name the non-metal used in fertilizer to enhance the growth of plants.

Ans: Nitrogen

Q30: Name the non-metal essential for our life, which all living being inhale during breathing

Ans: Oxygen

Q31: State the uses of aluminium.

Ans: Aluminium is used for making wires, furniture utensils, vehicles, machines, parts of aircrafts, for packing food and medicines etc.

Q32: State the uses of gold and silver.

Ans: Gold is used for making coins, jewellery, medals etc.

Silver is used for making jewellery, Coins, medals etc.

Q33: What is corrosion?

Ans: The surface of some metals gets corroded when exposed to moist air for a long time. This is called corrosion.

Q34: What is galvanisation?

Ans: Coating of metals with non-corrosive metals like zinc prevents corrosion of metals this process is called galvanisation.

Q35: Complete the following reaction:

Rusting of iron is an oxidation reaction, which is takes place as
3Fe + O2 + _____ 3 FeO + H2

Ans: 3Fe + O2 + H2O 3 FeO + H2

Q36: Non-metals generally do not react with acids but metals react with acids and produce hydrogen gas that burns with a _____ sound .

Ans: Pop

Q37: Which is more reactive iron or copper?

Ans: Iron

Q38: Which is less reactive sodium or gold?

Ans: Sodium

Q39: Sodium is very reactive metal, yes or no?

Ans: Yes

Q40: Rusting of iron can be prevented by coating its surface with new iron metal, yes or no?

Ans: no

Short Q&A:

Q1: Differentiate between metals and non-metals.

Ans:

Metals	Non - metals
• Metals have Metals are hard except sodium and potassium which are soft • Metals are malleable and can be beaten into thin sheets through heating and hammering • Metals are ductile and can be drawn into wires • Metals are good conductors of heat • Metals are good conductor of electricity	• Non-Metals are generally soft except diamond which is very hard • Non-Metals are non-malleable, brittle and cannot be beaten into thin sheets through heating and hammering • Non-Metals are not ductile and cannot be drawn into wires • Non-Metals are poor conductors of heat • Non-Metals are poor conductor of electricity

Q2: Why we use aluminium foil to wrap food items?

Ans: The property of metals by which they can be beaten into thin sheets, is called malleability. Aluminium is a metal. Aluminium foils are made by using this property of aluminium. They keep food items warm and prevent them from getting contaminated.

Q3: Why can't we store lemon pickles in an aluminium container?

Ans: As we know metals react with acids and produce metal salts and hydrogen gas, aluminium is a metal and lemon contains citric acid. So if we store lemon pickle in an aluminium utensil after some time utensil metal will get corroded due to reaction and lemon pickle inside will not be fit for human consumption.

Q4: Explain malleability in metals and non-metals.

Ans: The property of metals by which they can be beaten into thin sheets is called malleability. This is the characteristic property of metals which is exploited to make silver foil for decorating food items and aluminium foil to store food items. Non-metals do not show this property, on beating a coal or wood they get break down into small pieces, thus we can say that metals are malleable and non-metals are not malleable.

Q5: Explain ductility in metals and non-metals.

Ans: The property of metals by which it can be drawn into wires is called ductility, thus we can see aluminium or copper wires around us. Non-metal do not show this property so we never see plastic wires around us, they are not ductile.

Q6: Why there is difference in sound on dropping a metal coin and a piece of coal?

Ans: This is because metals produce ringing sound and are called sonorous while non-metals do not show this property.

Q7: State some of the chemical properties of metals.

Ans:

a. Reaction with oxygen:-
   Metals react with oxygen to form metallic oxides. These are basic oxides because they react with water to form bases. E.g. Magnesium burns in air to form magnesium oxide.Magnesium reacts with water to form magnesium hydroxide.
   2 Mg + O2 ---> 2 MgO MgO+ H2O ---> Mg(OH)2
b. Reaction with water:-
   Metals react with water to form metal hydroxides and hydrogen.
   Eg. Sodium reacts with water to form sodium hydroxide and hydrogen.
   2 Na + 2 H2O ----> 2 Na OH + H2
   Magnesium reacts with water to form magnesium hydroxide and hydrogen.
   Mg + H2O ----> Mg(OH)2+ H2
c. Reaction with acids:-
   Metals react with acids to form metallic salts and hydrogen.
   Eg. Zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen.
   Zn + 2 HCl ----> ZnCl2+ H2
d. Metals replace metals:-
   A more reactive metal replaces a less reactive metal from its salt solution.
   Eg. Magnesium replaces copper from copper sulphate solution to form magnesium sulphate and copper.
   Mg + CuSO4 ----> MgSO4+ Cu
   Zinc replaces copper from copper sulphate solution to for zinc sulphate and copper.
   Zn + CuSO4 ----> ZnSO4 + Cu

Q8: State some of the chemical properties of non-metals.

Ans:

a. Reaction with oxygen:
   Non-metals react with oxygen to form non-metallic oxides. These oxides are acidic oxides because they react with water to form acids.
   Eg. Sulphur burns in air to form sulphurdioxide. Sulphurdioxide reacts with water to form sulphurous acid.
   $S + O_2 \rightarrow SO_2$
   $SO_2 + H_2O \rightarrow H_2SO_3$
b. Reaction with water:
   Non-metals do not react with water
c. Reaction with acids:
   Most non-metals do not react with acids.
   Some non-metals like sulphur react with concentrated nitric acid to form sulphur dioxide, nitrogen dioxide and water.
   $S + 4\,HNO_3 \rightarrow SO_2 + 4\,NO_2 + 2\,H_2O$

Q9: Explain the process of rusting of iron.

Ans: The surface of some metals gets corroded when exposed to moist air for a long time. This is called corrosion. Rusting of iron is an example of corrosion, here an oxide is formed and the chemical equation for the same is;The chemical equation for rusting of iron is
$2Fe + 3/2\,O_2 \rightarrow Fe_2O_3.xH_2O$

Q10: Explain the process of rusting of copper.

Ans: When a copper vessel is exposed to moist air for long time, it acquires a dull green coloured coating on its surface; this green material is the mixture of copper hydroxide and copper carbonate. Reaction is as follow:
$2Cu + H_2O + CO_2 + O_2 \rightarrow Cu(OH)_2 + CuCO_3$

Q11: Explain reaction between sulphur and oxygen. What is the nature of its oxide formed?

Ans:

a. Reaction with oxygen:
   Non-metals react with oxygen to form non-metallic oxides. These oxides are acidic oxides because they react with water to form acids.
   Eg. Sulphur burns in air to form sulphurdioxide. Sulphurdioxide reacts with water to form sulphurous acid.
   $S + O_2 \rightarrow SO_2$
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b. Reaction with water:
   Non-metals do not react with water
c. Reaction with acids:
   Most non-metals do not react with acids.
   Some non-metals like sulphur react with concentrated nitric acid to form sulphur dioxide, nitrogen dioxide and water.
   $S + 4\,HNO_3 \rightarrow SO_2 + 4\,NO_2 + 2\,H_2O$

Q12: Explain activity series of metals.

Ans: The arrangement of metals in decreasing order of their reactivity is called reactivity series of metals. Reactivity series of metals is used to summarize information about the reactions of metals with acids and water, single displacement reactions and the extraction of metals from their ores.

Q13: Explain noble metal and their uses.

Ans: Metals that retain their lustre because they do not react with air, water or acids are called noble metals. Like gold, silver, platinum etc. gold and silver are used in making jewellery, coins and medals and platinum is used for making metals are used for making jewellery, electrical gadgets, etc.

Q14: State the role played by metals in our daily life.

Ans: Metals plays very important role in our day to day life, metals like iron is used for making pins, nuts, nails, bolts tools, machines etc., aluminium is used for making utensils, wires, parts of aircraft, vehicle, packaging of food stuffs and medicines etc., copper is used for making wires, vessels and electrical gadgets. Gold and silver are used in making jewellery, coins and medals and platinum is used for making metals are used for making jewellery, electrical gadgets, etc. sodium compounds are used as common salt, calcium compounds are used for making cement, glass etc.

Q15: State the role played by non-metals in our daily life.

Ans: Non-metals are essential for our life. Non-metals like oxygen are used for respiration by living beings and for burning of fuels. Nitrogen is used for making ammonia which is an important constituent of fertilizers used for improving soil quality for crop production. Sulphur is used for making sulphuric acid and salts of metals. Hydrogen is used for making ammonia which is used for making fertilizers and as fuels in rockets. Chlorine is used to kill germs in water and iodine is used as an antiseptic as well as a disinfectant.

Q16: State all possible ways of prevention of corrosion of metals.

Ans: Corrosion of metals can be prevented by :

- Applying oil grease
- Applying paint
- Galvanisation
- Electroplating
- Alloying: (Eg. When iron is alloyed with chromium and nickel, it forms stainless steel which is resistant to corrosion)

Q17: Give an example to illustrate that generally metallic oxides are basic in nature.

Ans: Burn a magnesium ribbon in air, and analyse the ash which is formed. The ash obtained by burning magnesium ribbon is dissolved in water and tested for its acidic or basis nature, we will observe it turns red litmus blue, thus concluded oxides of magnesium is basic in nature, amd in general metallic oxides are basic in nature.

Q18: Explain metallurgy.

Ans: Metallurgy is the science of extraction of metals from their ores and their purification. It involves following steps:

- Concentration of the ore: is the removal of impurities from the ore.
- Reduction: the process of obtaining the metal from its compound.
- Refining: is the process of purification of the impure metals to obtain the pure metal.

Q19: Have you ever seen a greenish deposit on the surface of copper vessels, what is that?

Ans: When a copper vessel is exposed to moist air for long time, it acquires a dull green coloured coating on its surface;this green material is the mixture of copper hydroxide and copper carbonate. Reaction is as follow:
$2Cu+H20+CO2+02$ ----> $Cu(OH)2 + CuCO3$

Q20: Explain the reaction between non-metal and oxygen.

Ans:

a. Reaction with oxygen:
Non-metals react with oxygen to form non-metallic oxides. These oxides are acidic oxides because they react with water to form acids.
Eg. Sulphur burns in air to form sulphurdioxide. Sulphurdioxide reacts with water to form sulphurous acid.
$S + O_2 \rightarrow SO_2$
$SO_2 + H_2O \rightarrow H_2SO_3$

b. Reaction with water:
Non-metals do not react with water

c. Reaction with acids:
Most non-metals do not react with acids.
Some non-metals like sulphur react with concentrated nitric acid to form sulphur dioxide, nitrogen dioxide and water.
$S + 4\,HNO_3 \rightarrow SO_2 + 4\,NO_2 + 2\,H_2O$

Q21: Explain how metals and non-metals react with water.

Ans:

a. Reaction with water:-
Metals react with water to form metal hydroxides and hydrogen.
Eg. Sodium reacts with water to form sodium hydroxide and hydrogen.
$2\,Na + 2\,H_2O \rightarrow 2\,NaOH + H_2$
Magnesium reacts with water to form magnesium hydroxide and hydrogen.
$Mg + H_2O \rightarrow Mg(OH)_2 + H_2$

b. Reaction with water:
Non-metals do not react with water

Q22: What do you mean by displacement reaction?

Ans: In a displacement reaction a more reactive metal can replace a less reactive metal, but a less reactive metal cannot replace a more reactive metal. For e.g.Iron replaces copper from copper sulphate solution to form iron sulphate and copper
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
Based on the reactivity of metals, they can be arranged in the decreasing order of their activity.

Q23: Write down the physical properties of metals.

Ans: Physical properties of metals:

- Metals are solid except mercury.
- Metals are hard.
- Metals are malleable that is can be beaten into thin sheets.
- Metals are ductile that is can be drawn into wires.
- Metals produce ringing sounds are called sonorous.
- Metals are lustrous.
- Metals are good conductors of heat and electricity.

Q24: Write down the physical properties of non-metals.

Ans: Physical properties of non-metals:

- Non- metals are solid, liquid or gas.
- Non- metals which is solid are brittle (diamond is the hardest).
- Non- metals are soft and dull in appearance.
- Non- metals are not malleable, and break down into powdery mass on tapping with a hammer.
- They are not sonorous.
- They are poor conductors of heat and electricity..

Long Q&A:

Q1: Explain physical and chemical properties of metals and non-metals.

Ans: Chemical properties of metals:

a. Reaction with oxygen:-
Metals react with oxygen to form metallic oxides. These are basic oxides because they react with water to form bases. E.g. Magnesium burns in air to form magnesium oxide.Magnesium reacts with water to form magnesium hydroxide.
2 Mg + O2 ---> 2 MgO MgO+ H2O ---> Mg(OH)2
b. Reaction with water:-
Metals react with water to form metal hydroxides and hydrogen.
Eg. Sodium reacts with water to form sodium hydroxide and hydrogen.
2 Na + 2 H2O ----> 2 Na OH + H2
Magnesium reacts with water to form magnesium hydroxide and hydrogen.
Mg + H2O ----> Mg(OH)2+ H2
c. Reaction with acids:-
Metals react with acids to form metallic salts and hydrogen.
Eg. Zinc reacts with dilute hydrochloric acid to form zinc chloride and hydrogen.
Zn + 2 HCl ----> ZnCl2+ H2
d. Metals replace metals:-
A more reactive metal replaces a less reactive metal from its salt solution.
Eg. Magnesium replaces copper from copper sulphate solution to form magnesium sulphate and copper.
Mg + CuSO4 ----> MgSO4+ Cu
Zinc replaces copper from copper sulphate solution to for zinc sulphate and copper.
Zn + CuSO4 ----> ZnSO4 + Cu

Chemical properties of non-metals:

a. Reaction with oxygen:
Non-metals react with oxygen to form non-metallic oxides. These oxides are acidic oxides because they react with water to form acids.
Eg. Sulphur burns in air to form sulphurdioxide. Sulphurdioxide reacts with water to form sulphurous acid.
S + O2 ---> SO2
SO2+ H2O ---> H2SO3
b. Reaction with water:
Non-metals do not react with water
c. Reaction with acids:
Most non-metals do not react with acids.
Some non-metals like sulphur react with concentrated nitric acid to form sulphur dioxide, nitrogen dioxide and water.
S + 4 HNO3 ---> SO2+ 4 NO2+2 H2O

Physical properties of metals:

- Metals are solid except mercury.
- Metals are hard.
- Metals are malleable that is can be beaten into thin sheets.
- Metals are ductile that is can be drawn into wires.
- Metals produce ringing sounds are called sonorous.
- Metals are lustrous.
- Metals are good conductors of heat and electricity.

Physical properties of non-metals:

- Non- metals are solid, liquid or gas.
- Non- metals which is solid are brittle (diamond is the hardest).

- Non- metals are soft and dull in appearance.
- Non- metals are not malleable, and break down into powdery mass on tapping with a hammer.
- They are not sonorous.
- They are poor conductors of heat and electricity..

Q2: Explain differences between metal and non-metal on the basis of their properties like hardness, malleability, ductility, appearance and heat conduction.

Ans:

Metals	Non - metals
• Metals have Metals are hard except sodium and potassium which are soft • Metals are malleable and can be beaten into thin sheets through heating and hammering • Metals are ductile and can be drawn into wires • Metals are good conductors of heat • Metals are good conductor of electricity	• Non-Metals are generally soft except diamond which is very hard • Non-Metals are non-malleable, brittle and cannot be beaten into thin sheets through heating and hammering • Non-Metals are not ductile and cannot be drawn into wires • Non-Metals are poor conductors of heat • Non-Metals are poor conductor of electricity

Q3: Give reason why copper cannot displace zinc from its salt solution, and why sodium and potassium are stored in kerosene.

Ans: Copper cannot displace zinc from its salt solution: because Zinc is more reactive than copper. A more reactive metal can replace a less reactive metal, but a less reactive one cannot replace a more reactive metal. Therefor Copper cannot displace zinc from its salt solution. Sodium and potassium are stored in kerosene because Sodium metal is very reactive. It reacts vigorously with oxygen and water. A lot of heat is generated in the reaction. It is, therefore, stored in kerosene.

Q4: Write word equation of the following reactions:

a. **Sulphur burning in air**
b. **Sulphur reacts with concentrated acid**
c. **Iron nail placed in copper sulphate solution.**

Ans:

a. Sulphur burning in air: Sulphurburns in air to form sulphurdioxide. Sulphurdioxide reacts with water to form sulphurous acid.
   $S + O2 \rightarrow SO2$
   $SO2 + H2O \rightarrow H2SO3$
b. Sulphur reacts with concentrated acid to form sulphur dioxide, nitrogen dioxide and water.
   $S + 4\ HNO3 \rightarrow SO2 + 4\ NO2 + 2\ H2O$
c. when Iron nail is placed in copper sulphate solution iron replaces copper from copper sulphate, thus nails becomes copper plated and blue colour of copper sulphate solution disappears and solutions turns from blue to light yellowish. Following reaction occurs:
   Copper sulphate ($CuSO4$) + Iron nail (Fe) ---> iron sulphate ($FeSO4$) + Copper (Cu)

Q5: What happens when dilute sulphuric acid is poured on a copper plate?

Ans: when dilute sulphuric acid is poured in a copper plate then copper undergo reaction with acid to form metal salts $CuSO4$ a blue crystalline solid and hydrogen gas:

Cu (Copper) + $H2SO4$ (Sulphuric Acid) => $CuSO4$(Copper sulphate) + $H2$ (Hydrogen gas)