SCIENCE

STD VIII

METALS AND NONMETALS

.SOME BASIC INFORMATION:

ELECTRONIC CONFIGURATION

THE DISTRIBUTION OF ELECTRONS IN VARIOUS SHELL OF AN ATOM IS CALLED ELECTRONIC CONFIGURATION.

OCTET LAW

EVERY ELEMENT TRIES TO LOSE,GAIN OR SHARE ITS ELECTRONS IN ORDER TO COMPLETE ITS OCTET (8e-) OR DUET (2e-).

THE FIRST SHELL (K) ACCORDING TO THE OCTET LAW, CAN ACCOMODATE TWO ELECTRONS,

WHEREAS THE SECOND (L) AND THIRD (M) SHELL CAN ACCOMODATE MAXIMUM OF 8 ELECTRONS EACH.

SOME BASIC PROPERTIES OF METALS AND NON METALS.

METALS

*METALS HAVE 1,2,3 VALENCE ELECTRONS WHICH THEY LOSE TO FORM POSITIVELY CHARGED CATIONS.

EG;. Na (11) --> 2, 8, 1 (loses 1 e-. So. +1)

Mg(12). --> 2, 8 ,2 (loses 2 e-. So. +2)

NON METALS

*NON METALS NORMALLY GAIN ELECTRONS TO COMPLETE THE OCTET ,THUS FORMING NEGATIVELY CHARGED ANIONS.

EG:. S(16). = 2, 8, 6. (gains 2 e-)(-2)

Cl(17). =.2,8, 7. (Gains1 e-)(-1)

DIFFERENCES BETWEEN METALS AND NONMETAL,ON THE BASIS OF THEIR GENERAL PROPERTIES:

1.METALS ARE GENERALLY HARD,STRONG SOLIDS AND ARE STRONG ENOUGH TO BEAR LOADS.HENCE, THEY HAVE HIGH TENSILE STRENGTH.

EG. Al, Fe, Zn, Pb, Cu.

*__EXCEPTION__: Na and K are soft solids and Hg is a liquid under ordinary conditions.

NON METALS ARE SOFT AND EXIST IN A STATE OF SOLID, LIQUID OR GAS AND ARE GENERALLY NOT KNOWN FOR THEIR TENSILE STRENGTH.

Eg C, Si, P, S, I, are all solids.

Bromine is a liquid non metal.

H2, N2 , O2 ,F2 are gases.

2.METALS HAVE A LUSTURE KNOWN AS METALLIC LUSTURE.EG. Al , Fe, Zn , Cu.

NON METALS ARE USUALLY NON LUSTROUS.

*__EXCEPTION__ - IODINE AND GRAPHITE.

3.METALS ARE SONOROUS(THEY PRODUCE A SOUND-METALLIC CLINK).

NONMETAL ARE NON SONOROUS.

4.METALS ARE MALLEABLE(THEY CAN BE BEATEN OR ROLLED INTO SHEETS) Eg. SILVER AND ALUMINIUM FOIL.

NON METALS ARE NON MALLEABLE.

5.METALS ARE GOOD CONDUCTORS OF HEAT AND ELECTRICITY.Eg.. METAL UTENSILS IN KITCHEN.

NON METALS ARE BAD CONDUCTORS OF HEAT AND ELECTRICITY.

* **EXCEPTION**-GRAPHITE.

6.METALS ARE DUCTILE(THEY CAN BE DRAWN INTO WIRES). Eg. ALUMINUM, COPPER WIRES.

NON METALS ARE NON DUCTILE.

<u>QUESTIONS AND ANSWERS****</u>

Q1.WHY CAN'T YOU USE NYLON OR JUTE ROPES FOR ELECTRICAL TRANSMISSION?

A1. WE CAN'T DO SO BECAUSE NYLON OR JUTE ARE NON - METALS AND THEY HOLD ON TO THEIR VALENCE ELECTRONS TOO LIGHTLY AND

SO ELECTRONS DON'T FLOW.HENCE, ELECTRICITY IS NOT CONDUCTED.

Q2. WHY CAN'T YOU USE CARBOARD UTENSILS FOR COOKING?

A2.WE CANNOT USE CARDBOARD UTENSILS FOR COOKING BECAUSE ITS IS A NON METAL AND THEREFORE IT WOULD NOT CONDUCT HEAT, RATHER IT WILL ABSORB HEAT AND BEGIN TO BURN.

Q3.WHY CAN'T YOU DRAW WIRES FROM A PIECE OF WOOD OR COAL.?

A3.WE CAN'T DO SO BEACUSE THEY ARE NON METALS AND ARE BRITTLE, THAT IS THEY ARE HARD AND RIGID AND HAVE LOW TENSILE STRENGTH,SO THEY CAN BE BROKEN READILY.

Q4. WHY IS GRAPHITE A GOOD CONDUCTOR OF HEAT AND LIGHT?

A4.GRAPHITE IS AN ALLOTROPE OF CARBON.

*IT HAS 4 VALENCE ELECTRONS BUT ONLY THREE ARE BONDED AND ONE OF THE ELECTRON IN EACH ATOM OF GRAPHITE IS FREE WHICH IS MOBILE AND IS RESPONSIBLE FOR CONDUCTION OF HEAT AND ELECTRICITY.

* THUS IT GIVES LUSTURE AND LEAVES MARK ON PAPER.

Q5. WHY ARE SODIUM AND POTASSIUM STORED IN KEROSENE OIL.?

A5.SODIUM AND POTASSIUM ARE EXTREMELY REACTIVE METALS.THEY REACT VIGOROUSLY WITH OXYGEN IN THE AIR AND WATER AND BEGIN TO BURN.

TO PREVENT THIS, THEY ARE STORED IN KEROSENE.

Q6.WHAT IS CORROSION?

A6.THE SLOW TARNISHING OF THE SURFACE OF A METAL ON BEING EXPOSED TO AIR AND MOISTURE IS TERMED AS CORROSION.

EG.. $Fe + H_2O + O_2 \rightarrow Fe_2O_3.xH_2O$(rust).

Q7.WHAT IS DISPLACEMENT REACTION?

A7.THE REACTIONS IN WHICH MORE REACTIVE METAL DISPLACES A LESS REACTIVE ONE FROM ITS SALT ARE KNOWN AS DISPLACEMENT REACTION.

2.METALS THAT COME HIGHER UP IN THE REACTIVITY SERIES DISPLACE THOSE METALS THAT COME BELOW THEM.

FOR EG.

$CuSO_4 + Fe \rightarrow FeSO_4 + Cu$ (Fe> Cu).

$AlCl_3 + Ag$ -- No Reaction (Al > Ag)

Q8. EXPLAIN DISPLACEMENT OF HYDROGEN FROM WATER.

A8. METALS THAT COME ABOVE HYDROGEN IN THE REACTIVITY SERIES CAN DISPLACE IT WHILE METALS BELOW HYDROGEN ,CANNOT DO SO.

*THE METALS ABOVE H CAN DONATE AN e- TO H+.

*WEAKER METALS CAN'T DO SO.

Eg.

$Na + H_2O \rightarrow NaOH + H_2$

$Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

But,

$Cu + H_2O \rightarrow$ × (No Reaction)

$Au + H_2O \rightarrow$ × (No Reaction)

Q9.EXPLAIN DISPLACEMENT REACTION OF HYDROGEN FROM DILUTE ACIDS.

A9. METALS THAT COME ABOVE HYDROGEN IN THE REACTIVITY SERIES CAN DISPLACE IT FROM DILUTE ACIDS.

THEY GIVE AN ELECTRON TO HYDROGEN.

EG. $Na + HCl \text{ -- } NaCl + H_2$

$Fe + H_2SO_4 \text{ -- } FeSO_4 + H_2$.

*METALS COMING BELOW HYDROGEN CANNOT DO SO.

Eg. $Hg + HCl + \times$ (No Reaction).

$Ag + H_2SO_4 \text{ -- } \times$ (No Reaction).

Q10.NAME 2 METALS WHICH REACT VIGOROUSLY EVEN WITH COLD WATER?

A10.SODIUM AND POTASSIUM.

Q11. WRITE THE REACTIVITY SERIES OF HALOGENS.

A11. F> Cl> Br > I

Eg. KI + Cl -- KCl + I (Cl > I)

NaF + Cl -- ×× (F>Cl).

Q12. MENTION 3 USES OF METALS.

A12. ALUMINIUM BEING A GOOD CONDUCTOR OF ELECTRICITY AND CHEAP, IS USED TO MAKE TRANSMISSION LINES.

2. Cu, Al, and Fe ARE USED TO MAKE COOKING UTENSILS BECAUSE THEY ARE MALLEABLE AND GOOD CONDUCTORS OF HEAT.

3. Ag, Au, and Pt ARE USED IN MAKING JWELLERY AS THESE ARE NOBLE METALS AND

DO NOT REACT WITH OXYGEN OR MOISTURE IN THE AIR.THEY ARE ALSO VERY DUCTILE.

Q13. DEFINE ALLOY.

A13.AN ALLOY IS A HOMOGENEOUS MIXTURE OF 2 OR MORE ELEMENTS OF WHICH AT LEAST ONE IS A METAL.

Eg. STEEL IS AN ALLOY OF MANGANESE, CARBON, IRON.

BRASS IS AN ALLOY OF COPPER AND ZINC.

Q14. WHAT IS AMALGAM?

A14.AMALGAM IS AN ALLOY IN WHICH AT LEAST ONE OF THE CONSTITUENTS IS MERCURY.

Q15.MENTION USES OF CARBON, NITROGEN, AND QXYGEN.

A15.*USES OF CARBON.

1.CARBON IN NATURE IS FOUND IN 3 FORMS- DIAMOND , GRAPHITE AND BUCKMINSTER FULLERENCE, WHICH HAVE THE FOLLOWING USES-

DIAMOND IS USED AS GEMS AND ALSO FOR CUTTING ROCKS AND GLASS

2.GRAPHITE BEING A GOOD CONDUCTOR OF ELECTRICITY IS USED AS AN ELECTRODE.

3.GRAPHITE HAS A HIGH MELTING POINT AND HENCE ACT AS A GOOD LUBRICANT IN MACHINES THAT ACQUIRE HIGH TEMPERATURE WHILE BEING OPERATED.

4. GRAPHITE IS ALSO USED IN MANUFACTURE OF PENCILS.

*USES OF OXYGEN.

1.IT US NEEDED FOR RESPIRATION BY ALL LIVING ORGANISM.

2.IT SUPPORTS COMBUSTION.

3.OXYGEN IN LIQUID FORM,IS USED AS A FUEL FOR ROCKETS.

4.IT IS REQUIRED FOR THE EXTRACTION OF METALS FROM THEIR ORES AND FOR PRODUCTION OF STEEL FROM IRON.

* USES OF NITROGEN :

1.IT DOES NOT SUPPORT COMBUSTION AND THUS PREVENT FIRE FROM SPREADING.

2.IT IS USED FOR THE PRODUCTION OF UREA AND AMMONIA.

3.LIQUID NITROGEN IS USED FOR PRESERVING DONATED ORGANS.

4.COMPOUNDS OF NITROGEN INCREASE SOIL FERTILITY.

DO IT BY YOURSELF

1.NAME 5 NONMETALS THAT ARE GASEOUS AT ORDINARY TEMPERATURES.

2.CAN YOU STORE FERROUS SULPHATE SOLUTION IN ZINC CONTAINER.WHY/WHY NOT? WRITE THE REACTION.

3.WHY IS Hg USED IN THERMOMETER?

4.SHOW ELECTRONIC CONFIGURATION OF ALUMINUM.

5.COMPLETE THESE.

* $Mg + H_2SO_4$--

* $Ag + H_2SO_4$ --

* $Au + H_2O$ --

* $Cu + ZnSO_4$ --