fill ur own

UNIT-1 BASIC CONCEPTS OF CHEMISTRY AND CHEMICAL CALCULATIONS:-

1. RELATIVE ATOMIC MASS:-

Relative atomic mass = $\frac{Average\ mass\ of\ the\ atom}{unified\ atomic\ mass}$

2. MOLE:-

- The term 'MOLE' is used to represent 6.023 X 10^{23} entities
- 12g of carbon 12-isotopes.

3. EQUIVALENT MASS:-

- Equivalent mass of an element, compound or ion is defined as the mass that combines or displaces 1.008g of hydrogen ,8g of oxygen or 35.5g of chlorine.
- Equivalent mass has no unit but gram equivalent mass has the unit g eq-1

4. OXIDATION NUMBER:-

- It is defined as the imaginary charge left on atom when all other atom of the compound have been removed in their usual oxidation states that are assigned according to the set of rules.
- A term that is often used interchangeably with oxidation number is oxidation state.

5. OXIDATION AND REDUCTION:-KG

OXIDATION	REDUCTION
Addition of oxygen	Removal of oxygen
Loss of electron* (LEO)	Gain of electron* (GER)
Increasing oxidation number is oxidation	Decreasing in oxidation number is reduction

6.AVAGADRO NUMBER:-

The total number of entities present in 1 mole of any substance is equal to 6.023 X 10^{23}. 6.023 X 10^{23} is Avagadro number.

7. LIMITING REAGENT:-

When a reaction is carried out using non-stoichiometric quantities of the reactants, the product yield will be determined by the reactants that is completely consumed and is called the limiting reagent.

8. EQUIVALENT MASS:-

Gram equivalent mass = $\frac{molar\ mass\ (g\ mol^{-1})}{Equivalence\ factor\ (eq\ mol^{-1})}$

9. CALCULATE RELATIVE ATOMIC MASS OF H:-

$= \frac{Average\ mass\ of\ H-atom\ (in\ kg)}{1.6605\ X\ 10^{-27} kg}$

$= \frac{1.6736\ X\ 10^{-27} kg}{1.66o5\ X\ 10^{-27} kg}$

= 1.0078 ≈ 1.008 u

UNIT-3 PERIODIC CLASSIFICATION OF ELEMENTS:-

1. MODERN PERIODIC TABLE:-

The physical and chemical properties of elements are periodic function based on their atomic number.

2. ISOELECTRONIC IONS:-

The ions have same electronic configuration are called isoelectronic ions.

Example: F^- 2,8 } Ne type K^+ 2,8,8 } Ar type

Na^+ 2,8 } Ne type Cl^- 2,8,8 } Ar type

3. EFFECTIVE NUCLEAR CHARGE:-

The net nuclear charge experienced by the valence electron in the outermost shell is called effective nuclear charge. $Z_{eff} = Z-S$. Where z is the atomic number and 'S' is the screening constant which can be calculated by slatter's rule

4. ELECTRONEGATIVITY:-

Electronegativity is defined as the relative tendency of an element present in a covalently bound molecules to attract the shared pair of electrons towards itself

5. ELEMENT 118:-

An element Z=118 will be present in 7^{th} period and 18^{th} group.

6. LANTHANIDES AND ACTINIDES:-

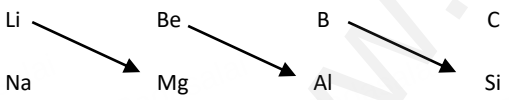
Lanthanides: (n-2) f^{1-14} (n-1) d^{0-1} ns^2 ; Actinides: (n-2) f^{0-14} (n-1) d^{0-2} ns^2

7. HALOGEN- OXIDISING AGENT:-

Halogens have ns2 np5 electronic configuration. They can ready to gain one electron in their valency shell. So they have more tendency to accept an electron in their outermost orbital. Therefore halogen act as an oxidising agents.

8. DIAGONAL RELATIONSHIP:-

The similarity in properties existing between the diagnonally placed elements is called 'diagonal relationship'.



9. TRIADS AND PERIODS:-

TRIADS: The atomic weight of the middle element nearly equal to the arithmetic mean of the atomic weights of the remaining two elements.

PERIODS: In modern periodic table horizontal rows are called periods. There are 7 periods. *(VEG—HOPE)*

10. PERIODIC LAW:-

The properties of the elements are the periodic functions of their atomic weights and this is called "PERIODIC LAW".

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UNIT-2 QUANTAM MECHANICAL MODEL OF ATOM:-

1. INFORMATION ABOUT QUANTAM NUMBERS:-

i) Principal quantum (n) – energy level

ii) Azimuthal quantum (l) – shape and size

iii) Magnetic quantum (m) – orientation

2. ORBITAL POSSIBLE (N=4):-

When n=4 l= 0,1,2,3 four orbital s,p,d,f

l=0 ml= 0 one 4s orbital

l=1 ml= -1,0,+1 three 4p orbital

l=2 ml= -2,-1,0,+1,+2 five 4d orbital

l=3 ml= -3,-2,-1,0,+1,+2,+3 seven 4f orbital

overall 16 orbitals.

3. ELECTRONIC ARRANGEMENT:-

i)

↑	↑	↑	↑	↑

GROUND STATE

ii)

↑	↑	↑	↑	↑

MAXIMUM EXCHANGE ENERGY

4. PAULI'S EXCLUSION PRINCIPLE:-

"No two electron in an atom can have the same set of value of all four quantum number". Which means each electron should have a unique values for all four quantum number (n,l,m,s).

5. ORBITALS VALUE:-

ORBITAL:- Circular path with definite energy is called orbitals

ORBITAL	n	l
3Px	3	1
$4d_{x^2-y^2}$	4	2

6. AUFBAU PRINCIPLE:-

"Aufbau" is a german word meaning "building up". In the ground state of the atoms, The orbitals are filled in the order of their increasing energies.

7. ELECTRONIC CONFIGURATION:-

Mn^{2+} → Mn =25

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^0\ 3d^5$ → (half filled -stable)

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Cr^{3+} → Cr =24

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^0\ 3d^3$ → (unstable electronic configuration)

9. **IONISATION ENERGY FOR H -ATOM:-**

$E_n = \frac{-13.6}{e^2}$ ev

n=3

→ $E_3 = \frac{-13.6}{9}$ ev

E_3 = -1.5 ev

10. **DE BROGLIE WAVELENGTH:-**

Potential energy = 100V = 100 x 1.6 x 10^{-19} J

$\lambda = \frac{h}{\sqrt{2}\,mev}$

$\lambda = \frac{6.626\ X\ 10^{-34} kgm^2 s^{-1}}{\sqrt{2}\ x\ 9.1\ x\ 10^{-31} kg\ x\ 100\ x\ 1.6\ x\ 10^{-19} J}$

λ = 1.22 x 10^{-10} m.

12. **HEINSBERG UNCERTAINTY PRINCIPLE:-**

It states that " it is impossible to accurately determine both the position and momentum of microscopic particle simultaneously.

13. **α – RAY EXPERIMENT:-**

i) Most of the α – particles passed through the foil

ii) some of them were deflected through a small angle

iii) very few α – particles were reflected back by 180°

11. **QUANTAM NUMBER AND SUB ENERGY LEVEL;-**

n	l	m	Sub energy level
4	2	0	4d
3	1	0	3p
5	1	-1, 0 , +1	5p
3	2	-2	3d

UNIT-4 HYDROGEN

1. WATER SHIFT GAS:-

$$CO + H_2O \overset{400\,^\circ C}{=} CO + H_2$$

Carbon mono oxide of a water can be converted in to carbon di oxide by moving a gas mixture with more steam at 400◦C and passed over a shift converter contains iron/copper catalyst. This reaction is called water gas shift reaction.

2. ISOTOPES OF HYDROGEN:-

Atoms of the same elements having same atomic number but, different in mass number is called isotopes. Ex:- $_{17}Cl^{35}$,$_{17}Cl^{37}$

Isotopes of hydrogen are:- 1) protium ($_1H^1$ or H) 2) Deuterium ($_1H^2$ or D) 3) Tritium ($_1H^3$ or T)

3. USES OF HEAVY WATER:-

i) Heavy water is used as moderator in nuclear reactor

ii) It is used as tracers to study organic reaction mechanism

iii) It is also used as a coolant in nuclear reactor.

4. EXCHANGE REACTION OF DEUTERIUM:-

Deuterium can replace reversibly hydrogen in compounds either partially or completely depending upon the reaction.

$$CH_4 + 2D_2 \rightarrow CD_4 + 2H_2$$

$$NH_3 + 3D_2 \rightarrow 2\,ND_3 + 3H_2$$

5.PARA TO ORTHO HYDROGEN:-

The para form can be catalytically transformed into ortho form using platinum/iron, by using an electric discharge, heating above 800◦C, mixing para magnetic molecules o_2,NO, NO_2 or with nascent/atomic hydrogen.

6. USES OF DEUTERIUM:-

i) Deuterium is used to prepare heavy water.

ii) Deuterium exchange reactions are useful determining the number of ionic hydrogens present in a given compound.

iii) Deuterium is also used to prepare some deuterium compounds.

7. REFER Q.NO 41 & 42:-

1) small size of nitrogen atom, polar nature of N-H bond. It forms intermolecular hydrogen bonding which are stronger than the other hydrides of the group which weak hydrogen bonding

2) This is due to expansion of lattice during the formation of their hydrides.

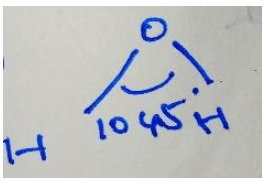
8. STRUCTURE OF H_2O AND H_2O_2:-

H_2O:-

i) H_2O has bent structure

ii) HOH bond angle is 104.5◦

iii)

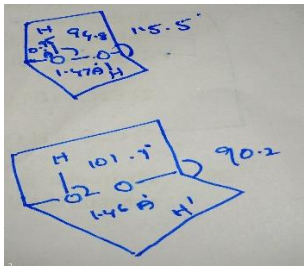


H_2O_2:-

i) H_2O_2 has a open book like structure

ii) H-O-O-H bond angle is 94.8◦ and dihedral angle is 115.5◦ in gas phase.

iii)



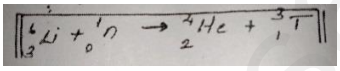
9. **INTER AND INTRA MOLECULAR HYDROGEN BOND:-**

Intra molecular bonding:- Intra molecular bonds are those which occur within a single molecule

Inter molecular bonding:- Inter molecular bonds occur between two separate molecules.

10. **PREPARATION OF TRITIUM:-**

Tritium is only present in trace amounts. So it can be artificially prepared by bombarding Lithium with slow neutrons in a nuclear fission reactor. The nuclear transmutation reaction is,



11. **USES OF H_2O_2:-**

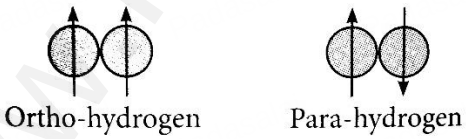
i) Hydrogen peroxide is a mild antiseptic used on the skin to prevent infection of minor cuts, scrapes and burns.

ii) It is also used as mouth rinse to help remove mucus or to relieve minor mouth irritation.

12. **ORTHO AND PARA HYDROGEN:-**

Ortho hydrogen: When molecular hydrogen is formed, the spin of nuclei in the same direction are called ortho hydrogen.

Para hydrogen: When molecular hydrogen is formed, the spin of nuclei in the opposite direction are called para hydrogen.



13. **USES OF H_2O:-**

i) liquid hydrogen is used as a rocket fuel.

ii) Hydrogen is also used in fuel cells for generating electric charge.

(For 3 marks and 5 marks – refer pg.no. 105 in volume 1)

UNIT-5 ALKALI AND ALKALINE EARTH METALS

1. **SODIUM HYDROXIDE IS MUCH SOLUBLE THAN CHLORIDE:-**

i) Sodium hydroxide is stronger base where as sodium chloride is a salt.

ii) Sodium hydroxide dissolves easily in water with evolution of much heat on amount of intense hydration.

iii) Thus sodium hydroxide dissolves easily in water.

2. **EFFLORESCENCE:-**

i) Efflorescence is a process of losing water of hydration from hydrate.

ii) Sodium carbonate crystallises as decahydrate which is in white colour.

iii) Upon heating, it loses the water of crystallization to form monohydrate.

3. **METAL LIKELY TO BE SODIUM OR POTASSIUM:-**

X= sodium → $Na_2SO_4.10H_2O$ is readily formed; The metal is more likely to be sodium.

4. **USES OF PLASTER OF PARIS:-**

i) It is largely used in the building industry.

ii) It is used for bone fracture or sprain

iii) It is also used for cast of statue and busts.

$$2CaSO_4.2H_2O(s) \xrightarrow{393\,K} 2CaSO_4.H_2O + 3H_2O$$

5. **REFER Q.NO 32:-**

Milk of magnesia $Mg(OH)_2$	Lye $Na(OH)_2$	Lime $Ca(OH)_2$	
Caustic potash KOH	Washing soda Na_2CO_3	Soda ash Na_2CO_3	Trona Na_2CO_3

6. **BERYLLIUM HALIDES ARE COVALENT THAN MAGNESIUM:-**

Beryllium halides are covalent due to smaller size and higher ionisation energy Whereas, due to larger atomic size and lesser ionisation energy magnesium halides are ionic.

7. **ALKALINE EARTH METALS HARDER THAN ALKALI METALS:-**

i) Group 2 elements have two electrons in the valence shell

ii) They have higher nuclear charge So, the alkaline metal is harder than alkali metals.

8. **PREPARATION OF PLASTER OF PARIS:-**

$2CaSO_4.2H_2O(s) \xrightarrow{393\,K} 2CaSO_4.H_2O + 3H_2O$ → It is prepared by heating gypsum with 393K.

9. **USES OF GYPSUM:-**

i) Gypsum is used in making dry walls or plaster boards. Plaster boards are used as the finish for walls and ceilings, and partition.

ii) Gypsum is used in making surgical and orthopaedic casts, such as surgical splints and casting moulds.

iii) Gypsum plays an important role in agriculture as soil additive, fertilizer, and conditioner.

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10. **LITHIUM EXHIBIT ANAMALOUS PROPERTIES:-**

Due to small size, the lithium atom has high ionisation energy. Hence it remains inactive to dry air, slowly reactivity with water, liquid bromine and forms a highly stable hydride unlike other alkali metals.

11. **USES OF WASHING SODA:-**

i) Washing soda is used heavily for laundering

ii) It is an important laboratory reagent.

iii) It is used in the manufacturing glass, paper, etc..,

12. **DEAD BURNT PLASTER:-**

When plaster of paris $CaSO_4.1/2H_2O$ is heated above 393K, its water of crystallisation is lost and anhydrous calcium sulphate is left that is known as dead burnt plaster.

13. **MILK OF LIME:-**

Lime water is the common name for a diluted solution of calcium hydroxide. Calcium hydroxide ($Ca(OH)_2$) is sparsely soluble in water. Pure limewater is colourless, with a slightly earthy smell and alkaline bitter taste of calcium hydroxide. It is unrelated to the acidic fruit.

UNIT-6 GASEOUS STATE

1. **BOYLE'S LAW:-**

When a gas is kept at constant temperature, the pressure of the gas is inversely propotional to the volume

It can be expressed as:- $P \alpha \frac{1}{v}$

2. **CHARLES LAW:-**

When the gas is kept at constant pressure, the volume is directly propotional to the temperature.

It can be expressed as:- $V \alpha T$

3. **APPLICATIONS OF GAY LUSAAC'S LAW:-**

According to Gay Lusaac's law $P \alpha T$ (n)

i) Firing a bullet

ii) Heating a closed aerosol can

iii) A burning auto mobile tire.

4. **REAL GAS DIFFER FROM IDEAL GAS:-**

Ideal gas obey the gas law PV = nRT , real gases do not obey the ideal gas law and called as non-ideal gas. The real gas tend to approach the ideal behaviour under certain condition.

5. **DIFFUSION & EFFUSION:-**

DIFFUSION	EFFUSION
The property of gas which involves the movement of the gas molecular through another gas is called diffusion	It is the property in which a gas escapes from a container through a very small hole.
It is the ability of gases to move with each other.	It is the ability of gas to travel through a small hole.
Ex:- smell of perfume diffuses in the air.	Ex:- Air escapes slowly through a pen hole in a line.