PAPER: GENERAL CHEMISTRY – II (16SCCCH2) CLASS: I B.Sc., CHEMISTRY

TWO MARK QUESTIONS WITH ANSWERS

UNIT-I

1. **Define ionic bond**

Ionic bond is a type of chemical bond which involves a transfer of electrons from one atom or molecule to another. Here, an atom loses an electron which is in turn gained by another atom.

2. **Define variable electovalency.**

The elements which change their valency or show more than one **electrovalency** are said to possess **variable electrovalency**. This happens due to- Unstable Configuartion of the last valence shell electrons like in transition elements of D-Block and due to inert pair effect.

3. **Define lattice energy.**

Lattice energy is an estimate of the bond strength in ionic compounds. It is defined as the heat of formation for ions of opposite charge in the gas phase to combine into an ionic solid. As an example, the lattice energy of sodium chloride, NaCl, is the energy released when gaseous Na^+ and Cl^- ions come together to form a lattice of alternating ions in the NaCl crystal.

4. **What is meant by covalent bond?**

A covalent bond indicates the sharing of electrons between atoms. Compounds that contain carbon (also called organic compounds) commonly exhibit this type of chemical bonding. The pair of electrons which are shared by the two atoms now extend around the nuclei of atoms, leading to the creation of a molecule.

5. **Define maximum covalency.**

Maximum covalency is **defined** as. "the **maximum** number of covalent bonds which an atom of that element can form with neighbouring atoms" for example hydrogen has **maximum covalency** of 1.

6. **Define variable covalency.**

Variable covalency refers the tendency of certain atoms to show different **covalencies** as a result of excitation of the atom. In the atoms that exhibit **variable covalency** the number of unpaired electrons increases as a result of excitation of the atom that causes it to have **variable covalency**

7. **Define bond order.**

B**ond order** is defined as half the difference between the number of bonding electrons and the number of antibonding electrons as per the equation below.. This often but not always yields similar results for bonds near their equilibrium lengths, but it does not work for stretched bonds. Bond order is also an index of bond strength and is also used extensively in valence bond theory.

8. **Define hybridization.**

Hybridization happens when atomic orbitals mix to form a new atomic orbital. The new orbital can hold the same total number of electrons as the old ones. The properties and energy of the new, hybridized orbital are an 'average' of the original unhybridized orbitals.

9. **What is hydrogen bonding?**

A **hydrogen bond** is a type of attractive (dipole-dipole) interaction between an electronegative atom and a **hydrogen** atom **bonded** to another electronegative atom. ... A **hydrogen bond** tends to be stronger than van der Waals forces, but weaker than covalent **bonds** or ionic **bonds**.

10. **State Fajan's rule**

Fajans' **rule states** that a compound with low positive charge, large cation and small anion has ionic bond where as a compound with high positive charge, small cation and large anion are covalently bonded.

UNIT-II

1. **Give the characteristics of s-block elements**

They are soft metals having low melting and boiling points.
They have low ionization enthalpies
They are reactive and readily form univalent (alkali metals) or bivalent (alkaline earth metals) ions by losing one or two valence electrons respectively.
They act as strong reducing agents.

2. **What is zero group elements?**

The **elements** which have a stable electronic configuration of s^2 p^6 and have very little or **zero** tendency to react with other **elements** are called **zero group elements** or inert gases or **zero** valent gases. ... **Elements** included under this **group** are helium, neon, argon, krypton, xenon and radon.

3. **What is meant by ore?**

Ores are naturally occurring rocks that contain metals or metal compounds in sufficient amounts to make it worthwhile extracting them.

4. **What is metallurgy?**

Metallurgy is defined as a **process** that is used for the extraction of metals in their pure form. The compounds of metals mixed with soil, limestone, sand, and rocks are known as minerals. ... **Metallurgy** deals with the **process** of purification of metals and the formation of alloys.

5. **What are alkaline earth metals?**

Many of the divalent strongly basic **metals** of group II of the periodic table comprising beryllium, magnesium, calcium, strontium, barium, and radium. — called also **alkaline earth**.

6. **What are alkali earth metals?**

Alkali metals are any of the elements found in Group IA of the periodic table (the first column). **Alkali metals are** very reactive chemical species that readily lose their one valence electron to form ionic compounds with nonmetals. All elements in the **alkali metal** group occur in nature.

7. **Give the main occurrence of metal.**

Most of the metals are quite reactive and hence they do not occur as free elements in nature but in the form of their compounds.

The compounds of metals are present in the form of oxides,sulphides,carbonates,chlorides.

The natural material in which the metals or their compounds are found in earth are called **minerals**.

8. **Discuss the applications of He.**

Helium gas is **used** to inflate blimps, scientific balloons and party balloons. It is **used** as an inert shield for arc welding, to pressurize the fuel tanks of liquid fueled rockets and in supersonic windtunnels

9. **Define diagonal relationship.**

A *diagonal relationship* is said to exist between certain pairs of *diagonally* adjacent elements in the second and third periods (first 20 elements) of the periodic table

10. **Give any two diagonal relationship between Li&Mg.**

Both have almost **similar electronegativities.**

Both Li and Mg are **quite hard**. They are harder and lighter than other elements in their respective groups.

Both LiOH and $Mg(OH)_2$ are **weak bases**.

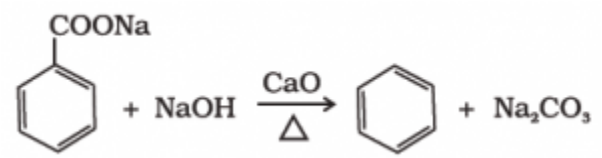
Both **form ionic nitrides** when heated in atmosphere of Nitrogen.

UNIT-III

1. **Define aromaticity.**

   Aromaticity is used to **describe** a cyclic (ring-shaped), planar(flat) molecule with a ring of resonance bonds that exhibits more stability than other geometric or connective arrangements with the same set of atoms.

2. **How to prepare benzene**



3. **Give the uses of benzene**

   Benzene is a widely **used** industrial chemical. **Benzene** is found in crude oil and is a major part of gasoline. It's **used** to make plastics, resins, synthetic fibers, rubber lubricants, dyes, detergents, drugs and pesticides. **Benzene** is produced naturally by volcanoes and forest fires
   .

4. **How to prepare naphthalene?**

It can be synthesized by Haworth synthesis, the steps are as follows:

The Friedel craft acylation reaction of benzene with succinic anhydride gives 3 benzoylpropionic acid.

Next is the Clemmenson's reaction with 3-benzoylpropionic acid which gives 4-phenylebutanoic acid.

On heating this product in the presence of conc. sulfuric acid results in the formation of ring structure of α-tetralene by the ellimination of water molecule.

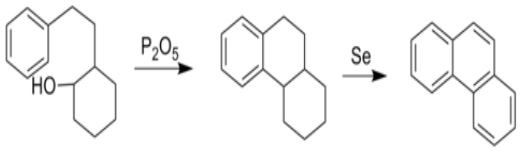
The Clemmenson reaction of α-tetralene gives tetrahydronaphthalene.

Dehydrogenation of tetrahydronaphthalene in the presence of selenium yields naphthalene.

5. **How to prepare anthracene?**

Coal tar, which contains around 1.5% anthracene, remains a major source of this material. Common impurities are phenanthrene and carbazole. A classic laboratory method for the preparation of anthracene is by cyclodehydration of o-methyl- or o-methylene-substituted diarylketones in the so-called Elbs reaction.

6. **How to prepare phenanthrene?**



7. **How to prepare biphenyl?**

$C_6H_5CH_3 + C_6H_6 \rightarrow C_6H_5{-}C_6H_5 + CH_4$

8. **Give the uses of anthracene.**

Anthracene is used in the artificial **production** of the red dye alizarin. It is also used in **wood** preservatives, insecticides, and coating materials.

9. **Give the uses of biphenyl.**

Biphenyl is **used** in organic syntheses, heat transfer fluids, dye carriers, food preservatives, as an intermediate for polychlorinated **biphenyls**, and as a fungistat in the packaging of citrus fruits.

10. **Give the uses of naphthalene.**

Naphthalene is used to make **mothballs**, PVC, insecticides (insect killing chemicals), dyes, toilet deodorant blocks, and phthalic anhydride. The latter, among many other things, **is used** to make pharmaceutical and resins. **Naphthalene** is flammable and potentially explosive.

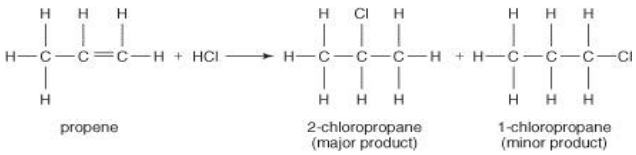
UNIT-IV

1. **Write any two haloalkanes with its IUPAC name**

CH_3CH_2I - 1-Iodoethane

$CH_3CH_2CH_2CH_2F$ - 1-fluorobutane

2. Give any one preparation of haloalkanes



3. Give the physical properties of haloalkanes

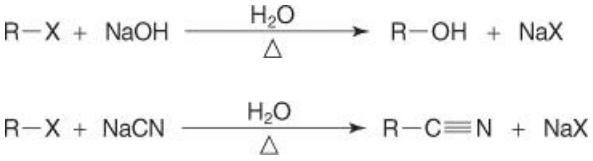
Many volatile halogen compounds are sweet in smell.

Lowers members are gases & higher members are liquid or solids. ...

As branching in **alkyl halide** increases the boiling point of **alkyl halide** decreases.

Alkyl halides are readily soluble in organic solvent but slightly soluble in water.

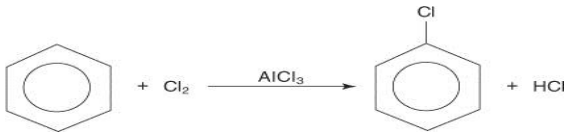
4. Give any two chemical properties of haloalkanes



5. Discuss the uses of haloalkanes.

They were **used** as refrigerants, propellants for aerosols, for generating foamed plastics like expanded polystyrene or polyurethane foam, and as solvents for dry cleaning and for general degreasing purposes

6. Give any one preparation of halobenzenes



7. Give the physical properties of halobenzenes

The physical properties of unsubstituted aryl halides are much like those of the corresponding alkyl halides. Thus, boiling points, melting points, and solubilities of aryl halides are very similar to those of alkyl halides containing the same number of carbon atoms

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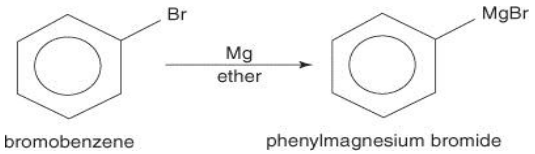
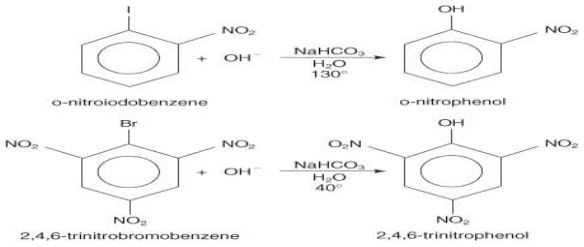
8. **Give any two chemical properties of halobenzenes**





9. **Discuss the uses of halobenzenes**

Chlorobenzene is the starting **aryl halide** for the synthesis of DDT; it also is a source of benzenol (phenol, Section 14-6C) which, in turn, has many **uses** (Section 26-1).

Several aromatic chloro compounds are used extensively as insecticides, herbicides, fungicides, and bactericides

UNIT-V

1. **Discuss the posulates of Rutherford's theory.**

Positive charge is concentrated in the center of the atom, called nucleus. Electrons revolve around the nucleus in circular paths called orbits. The nucleus is much smaller in size than the atom.

2. **Define wave length**

Wavelength is the distance between identical points in the adjacent cycles of a waveform signal propagated in space or along a wire.

Wavelength is inversely related to frequency, which refers to the number of wave cycles per second. The higher the frequency of the signal, the shorter the **wavelength**.

3. **Define velocity**

velocity is a physical vector quantity; both magnitude and direction are needed to *define* it. The scalar absolute value (magnitude) of *velocity* is called *speed*

4. **Define wave number**

The term **wave number** refers to the **number** of complete **wave** cycles of an electromagnetic field (EM field) that exist in one meter (1 m) of linear space. **Wave number** is expressed in reciprocal meters (m^{-1}).

5. **State Heisenberg uncertainty principle**

The uncertainty principle states that the position and velocity cannot both be measured,exactly, at the same time (actually pairs of position, energy and time)

6. **What is block body?**

A **black-body** is an ideal object that emits all frequencies of radiation with a spectral distribution that depends only on the temperature and not on its composition. The radiation emitted by such an object is called **black-body** radiation

7. **Define photoelectric effect**

The **photoelectric effect** is the emission of electrons or other free carriers when electromagnetic radiation, like light, hits a material. Electrons emitted in this manner can be called photoelectrons.

8. **Define Compton effect**

The **Compton effect** (also called **Compton scattering**) is the result of a high-energy photon colliding with a target, which releases loosely bound electrons from the outer shell of the atom or molecule.

9. **Define Schordinger wave equation**

Schrodinger wave equation is a mathematical expression describing the energy and position of the electron in space and time, taking into account the matter wave nature of the electron inside an atom.

It is based on three considerations. They are;

- Classical plane wave equation,
- Broglie's Hypothesis of matter-wave, and
- Conservation of Energy.

10. **Define dualism of light.**
    The wave-particle *dualism*, that is the wave nature of particles and the particle nature ... Here we consider not only matter waves but also *light* waves. ...

FIVE MARK & TEN MARK QUESTIONS

UNIT-I

5 MARKS:

1. ***Explain Born-Heber cycle***
2. Discuss the partial ionic character of covalent bond
3. Compare VBT and MOT
4. ***Write a note on MOT***
5. ***Discuss the formation of BeCl2 based on hybridization***
6. Explain VSEPR theory
7. Disucss the types of hydrogen bonding
8. ***Write the consequences of hydrogen bonding***

10 MARKS

1. ***Discuss Fajan's rule***
2. ***Discuss the applications of MOT***
3. Explain hybridization with examples.
4. Write a note on hydrogen bonding
5. Write a note on VBT

UNIT-II

5 MARKS:

1. ***Discuss the chemistry of NaOH.***
2. ***Discuss the chemistry of KI.***
3. Explain calcination method
4. ***Write a note on XeF6 compound***
5. Write a note on XeOF6 compound
6. ***Discuss smelting and roasting process***.
7. Discuss the position of zero group elements in periodic table
8. ***Explain electrolysis process.***

10 MARKS:

1. ***Explain the isolation process of zero group elements.***

2. Write a note on Zone refining.
3. Discuss van Arkel de-Boer process
4. Discuss aluminothermic process
5. ***Explain the diagonal relationship between Li&Mg***
6. ***Explain the diagonal relationship between Be&Al***

UNIT-III

5 MARKS:

1. Explain aromatic electrophilic substitution reaction and mechanism.
2. Discuss the structure of benzene
3. Discuss the structure of naphthalene
4. Discuss the structure of phenanthrene
5. Discuss the structure of biphenyl
6. Discuss the structure anthracene
7. Explain the orientation and reactivity of benzene
8. Discuss the reactivity of naphthalene
9. Discuss the mechanism of electrophilic substitution reaction in naphthalene
10. Write Huckle rule for aromaticity.

10 MARKS:

1. Discuss the preparation, properties and uses of benzene
2. Discuss the preparation, properties and uses of naphthalene
3. Discuss the preparation, properties and uses of phenanthrene
4. Discuss the preparation, properties and uses of anthracene
5. Discuss the preparation, properties and uses of biphenyl

UNIT-IV

5 MARKS:

1. Explain the structure of haloalkanes
2. Give the preparation of haloalkanes
3. Give the physical properties of haloalkanes
4. Discuss the chemical properties of haloalkanes
5. Give the preparation of halobenzene
6. Give the physical properties of halobenzene
7. Discuss the chemical properties of halobenzenes
8. Explain electrophilic substitution reaction and mechanism
9. Explain nucleophilic substitution reaction and mechanism

10 MARKS:

1. Explain SN1 reactions and mechanism with suitable evidences
2. Explain SN2 reactions and mechanism with suitable evidences
3. Write a note on haloalkanes
4. Discuss the preparation, properties and uses of halobenzene

UNIT-V

5 MARKS:

1. Write Sommerfield extension theory.
2. Explain photoelectric effect
3. Discuss Compton effect
4. Explain block body radiation with examples
5. Explain DeBrogile process.
6. Explain the dualism of light
7. Explain Planck Quantum theory
8. Discuss electromagnetic radiations
9. Give the physical significance of ψ and ψ^2

10 MARKS:

1. Explain Rutherford model of an atom
2. Explain Bohr's model of an atom
3. Discuss the hydrogen spectrum
4. Explain Davission and Germer experiment
5. Derive Schordinger wave equation.