**IMAYAM ARTS AND SCIENCE COLLEGE**

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**DEPARTMENT OF CHEMISTRY**

**Subject: Nuclear, industrial chemistry and metallic state**

**Subject Code: 16SMBECH2**

***Unit – I***

***2Marks***

1. **Isotopes**

The atoms of elements which have same atomic number but different mass number.

 Ex: 1H1, 2H1, 3H1

1. **Isobars**

The atoms of elements which have same mass number but different atomic number.

 Ex: 40Ar18, 40K19, 40Ca20

1. **Isotones**

The atoms of elements which have different mass number and different atomic number but same no of neutrons

Ex: 14C6, 15N7, 16O8

1. **Isomers**

Isomers are molecules that have the same molecular formula, but have a different arrangement of the atoms in space.

1. **What is the composition of nucleus?**

The nucleus is the center of an atom. It is made up of protons and neutrons joined by the nuclear forces and are surrounded by the electron cloud.

1. **Subatomic particles**

Particles that are smaller than the atoms are called subatomic particles. The three main subatomic particles are protons, neutrons and electrons.

1. **Nuclear forces**

The proton and neutron are bound together in nucleus due to strong forces acting despite of electrostatic repulsion among protons. This force is called nuclear forces.

1. **Nuclear stability**

Nuclear stability means that nucleus is stable, that it does not spontaneously emit any kind of radiation.

1. **Mass defect**

The difference between calculated and experimental masses of the nucleus is called mass defect.

1. **Binding energy**

Binding energy of atom is defined as the energy released when the given number of proton and neutron joining to form its nucleus.

1. **Packing fraction**

The difference between the isotopic mass of a nuclide and its mass number divided by its mass number. The packing fraction is often interpreted as a measure of the stability of the nucleus.

1. **Whole number**

The whole number rule states that the masses of the isotopes are whole number multiplies of the mass of the hydrogen atom

1. **Radioactivity**

The disintegration or decay of unstable atoms accompanied by emission of radiation is called radioactivity.

1. **Radioactive disintegration**

The spontaneous breaking up the nucleus is known as radioactivity disintegration or radioactive decay.

1. **Groupdisplacement law**

This law states as “ when an α-particles is emitted from a radioactive element(parent element) the new element (daughter element)formed has atomic number 2 unit less and mass number 4 unit less than the parent elements sonsequently displaced two places ot the left of the periodic table.

1. **Geiger – Nuttal rule**

The relationship between the range(R) of the α-particles emitted by the radio nucleid and the radioactive constant (λ) or the period of average life (tav = 1/λ).

 log λ = b + c logR

***5 marks***

1. **Explain mass defects and binding energy.**
2. **Explain the packing fraction and whole number**
3. **Explain the liquid drop model**
4. **Explain the odd even rule and n/p ratio**
5. **Explain group displacement law.**
6. **Explain the mode of decay**
7. **Explain the rate of disintegration**

***10 marks***

1. **Discuss the separation of isotopes.**
2. **Discuss the detection of isotopes**
3. **Discuss and derive the half life period of radioactivity**
4. **Discuss the characteristic of α, β and γ – rays.**
5. **Discuss the rate of integration.**

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***Unit – II***

***2marks***

1. **Classification of nuclear reaction**

Based on over all energy transformation

 Capture reaction

 Particle – particle reaction

 Fission reaction

 Fusion reaction

 Spallation reaction

1. **Fission reaction**

The heavier nucleus breaks down into two or more lighter nuclei almost equal size and large amount energy is liberated.

1. Fusion reaction

The two lighter nuclei are combined or fused together give a stable and heavier nucleus with larger amount of energy is liberated.

1. Stellar energy

It is a internal energy of the stars and radiated by stars.

1. Linear accelerator

A linear particle accelerator is a type of particle accelerator that accelerates charged subatomic particles or ions to a high speed by subjecting them to a series of oscillating electric potentials along a linear beam line.

1. Carbon dating

It is a method used to date materials that once exchanged carbon dioxide with the atmosphere.

1. Artificial radioactivity

The process in which an element is converted into a new radioactive isotopes by artificial by bombarding the element with fast moving particles like proton, deuterium, helium is called artificial or induced radioactivity.

***5 marks***

1. **Discuss wilison cloud chamber**
2. **Gieger muller counter**
3. **Particle accelaration**
4. **Artificial radioactivity**
5. **Classification of nuclear reaction**
6. **Atomic bomb**
7. **Hydrogen bomb**

***10 marks***

1. **Nuclear reactor**
2. **Stellar energy**
3. **Application of radio isotopes**
4. **Carbon dating**
5. **Hazards of radiations**

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***Unit –III***

***5marks***

1. **Pauling band theory**
2. **Hume rothery ratio**
3. **Packing of atoms in CCP, HCP**
4. **Semi conductors**
5. **structure of alloys,**
6. **Substitutional and interstitial solid solutions,**
7. **n-type conductors**
8. **p- type conductors**

***10marks***

1. **Explain stoichiometric and non- stoichiometric defects.**
2. **Discuss the n & p – type conductors**
3. **Detailed explain on metallic bonds**
4. **Industrial application of electronic semi conductors**

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***Unit – IV***

***2marks***

1. **Preparation of silicates**

It may be prepared by fusing metal oxides or carbonates with sand

 Fused with sand

Na2CO3 (Na2SiO4.Na2SiO3)n

1. **Classification of silicates**

Ortho silicates

Pyro silicates

Cyclic silicates

Chain silicates

1. **Write any two uses of mica?**

It is used as an electrical insulators.

It is also used in electrical capacitors and for windows in furnace.

It is used in paint as pigment.

1. **Classification of feldspar**

Orthoclase feldspar, plagioclase feldspar.

1. **Zeolites minerals**

Erionite , gemelinite

1. **Coordination polymer**

A coordination polymer is an inorganic or organometallic polymer structure containing metal cation centers linked by ligands.

1. **Phosphonitrlic polymer**

These are also known as phosphazenes and form a part of large number of compounds containing P-N and P=N bonds

1. **Inorganic polymer**

Inorganic polymer is a large molecules that lack carbon and are polymer that is made up of many small repeating called monomers.

***5marks***

1. **Discuss the inorganic polymer**
2. **Discuss the properties of asbestos**
3. **Discuss the preparation, properties of slilcates**
4. **Write notes on talc and mica**
5. **Write note on phosphonitrlic polymer**

***10marks***

1. **Explain the types of silicates**
2. **Explain the composition and properties of feldspar, zeolite and mica**
3. **Explain the inorganic polymers.**

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***Unit – V***

***2marks***

1. **Composition of natural gas**

Methane – 85%

Propane – 4%

Ethane – 8%

Butane – 1.5%

Other higher alkanes – 1.5%

1. **Preparation of water gas**

It is obtained when a balst of steam is forced up through a white hot bed of coke or coal.

 C + H2O H2 + CO

1. **Composition of semiwater gas**

Nitrogen – 55%

Hydrogen – 15%

Methane – 2%

CO – 30%

CO2  - 10%

1. **Preparation of producer gas**

It is obtained by burning the coke in limited supply of air.

1. C + O2 CO2
2. CO2 + C 2CO
3. **Classification of fertilizer**

Based on natural elements like N, P and K

 Nitrogenous fertilizer

 Phosphatic fertilizer

 Potash fertilizer

 N-P fertilizer

 N-P-K fertilizer

1. **Types of varnish**

Oil varnishes, water varnishes, asphalt varnish, spar varnish

1. **Composition of cement**

CaO – 62%

SiO2 – 22%

Al2O3 – 7.5%

MgO – 2.5%

Fe2O3 – 2.5%

SO2 – 1.5%

Na2O – 1.0%

K2O – 1.0%

1. **Types of glass**

Soft glass, hard glass, flint glass, pyrex glass, safety glass, quartz glass.

***5Marks***

1. **Explain the manufacture of natural gas.**
2. **Write the notes on LPG and gobar gas.**
3. **Discuss the role of micronutrients in plant life.**
4. **Detail notes on paint and varnishes**
5. **Discuss the manufacture of safety matches**
6. **Explain the manufacture of water gas and semi water gas.**
7. **Write short notes on mixed fertilizer.**
8. **Write notes on setting of cement.**

***10Marks***

1. **Discuss the detailed note on wet process in cement.**
2. **How will you prepare carbureted water gas? Explain its composition and uses.**
3. **Detailed notes on nitrogenous fertilizer**
4. **Write notes on super phosphate and potassium fertilizer.**
5. **Discuss the various type and composition of glass.**

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