**SENGAMALA THAYAAR EDUCATIONAL TRUST**

**WOMEN’S COLLEGE**

**SUNDARAKKOTTAI, MANNARGUDI.**

**DEPARTMENT OF CHEMISTRY**

**NUCLEAR, INDUSTRIAL CHEMISTRY & METALLIC STATE**

**TWO MARK QUESTIONS**

1. **What are the three fundamental particles present in an atom?**

Proton, electron and neutron.

1. **Define nuclear chemistry?**

Nuclear chemistry is defined as the branch of chemistry which deals with the study of atomic nucleus and nuclear charge.

1. **Name some mass particles.**

Electrons, protons, antiprotons and positrons.

1. **Name some energy particles**.

Neutrino, photons and gravitons.

1. **What are nuclear forces?**

They are attractive forces existing in the nucleus between proton and neutron; neutron and neutron and even between proton and proton.

1. **Define N/P Ratio?**

The ratio between the number of neutrons present in the nucleus of an element and the number of protons present in the same nucleus is called N/P Ratio.

1. **What is meant by Mass defect?**

The difference between expected mass of an element and the actual mass is known as the mass defect.

1. **Define Binding energy.**

It may be defined as the energy released when a given number of proton and neutrons combine to form a nucleus.

1. **Define Isotopes.**

Atoms of a given element which have same atomic number but different atomic weights are called isotopes.

1. **What is Magic numbers?**

The study of the electronic configuration of elements, neutral atoms containing a total of 2, 10, 18, 36, 54 and 86 extra nuclear electrons (noble gases) are remarkably stable and they do not undergo chemical reactions. 2, 8, 20, 50, 82 and 126 nucleons of the atom are very stable. These numbers are called Magic numbers.

1. **Define nuclear isomers.**

Atoms having same mass number and same atomic number but differing in their radioactive properties are called nuclear isomers.

1. **Define Isotones.**

Atoms having same number of neutrons but differing in their mass numbers are called isotones.

1. **Define Isobars.**

Atoms of different elements having the same mass number but different atomic number are called Isobars.

1. **What is meant by Packing fraction?**

Isotope mass – mass number

Packing fraction = ------------------------------------ X 106

Mass number

1. **What are the different types of nuclear models?**

The nuclear shell or independent model, the liquid drop model, the collective model, the Fermi gas model and optical model.

1. **How many protons and neutrons and electrons are present in 17Cl35 and 11Na23?**

In 17Cl35 no. of protons 17, no of electrons 17, no of neutrons 18, in 11Na23 no. of protons 11, no of electrons 11, no of neutrons 12.

1. **Define Isobars.**

Atoms of different elements having the same mass number but different atomic number are called Isobars.

1. **What are the different types of methods used to detect the isotopes?**

Aston’s mass spectrograph, Dempster’s mass spectrograph, Bainbridge’s mass spectrograph, Nier’s mass spectrograph and Goudsmit mass spectrometer.

1. **State the different methods used to separate isotopes?**

Gaseous diffusion method, thermal diffusion method, fractional distillation and evaporation method, electromagnetic method, the centrifugal method, electrolytic method, chemical exchange method and ion exchange and chromatographic method.

1. **What is meant by Separation factor?**

n1/n2

S = -----------

N1/N2

1. **What are various standards used to determine the atomic weight of an element?**

Hydrogen standard, Oxygen standard and carbon standard.

1. **Define Radioactivity.**

The spontaneous disintegration of a substance resulting in the emission of radiations is called radioactivity.

1. **What are the two types of radioactivity?**

Natural radioactivity and artificial radioactivity.

1. **What are the three emitted radiations?**

α rays, β rays and Gamma rays.

1. **Write any two methods for the detection of radioactivity.**

Geiger – Muller counter, Wilson cloud chamber.

1. **Define Group displacement law.**

When α particle is emitted the daughter element has atomic number two units less than that of the parent element. So its position in the periodic table will be two places left to the parent element. Similarly, when a β particle is emitted the daughter element has atomic number one unit more than that of the parent element. So its position in the periodic table will be one place right to the parent element. This is called group displacement law.

1. **Define Radioactive series.**

Most of the natural radio-active elements of higher atomic numbers exist in nature as a number of radio-active isotopes. All the radio-active isotopes, which are about 40 in number, belong to definite chains of successive decays. These are called radioactive series. They are uranium, thorium, actinium and neptunium series.

1. **What is meant by Artificial radioactivity?**

Artificial radioactivity is a process by which a new radioactive isotope of a known element can be prepared.

1. **Define nuclear fission.**

Splitting of a nucleus into nearly equal parts with release of energy is called nuclear fission.

1. **Define nuclear fusion.**

It is the process of combining of fusing two lighter nuclei into a stable and heavier nuclide with release energy is called nuclear fusion.

1. **What is meant by nuclear reactor or Atomic pile?**

It is an apparatus in which the nuclear fission is produced in the form of a controlled self sustaining chain reaction. In other words it is a controlled chain reacting system supplying nuclear energy.

1. **Write the formula for the determination of Rock – dating or Age of earth.**

2.303 T Pb206

t =  ------------------- log ﴾ 1+- ------------ ﴿

0.693 U238

Where t = the age of rock

T= Half life period of U238 (known: 4.5 x 109 years)

Pb206 = Amount ofPb206 present in the sample in moles.

U238 = Amount of U238 present in the sample in moles.

1. **Write the formula for the determination of C-14 dating or Age of earth.**

2.303 T Amount of C14 in fresh wood

t = ------------------- log [1+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ]

0.693 Amount of C14 in dead wood

1. **What are the different types of disposal of radioactive wastes?**
2. Method in dispose low level waste
3. Method of disposal intermediate level waste
4. Method to dispose high level wastes.
5. **Write down the recent disposal methods.**

Reprocessing method and Immobilization technique.

1. **Write down the various methods involving in immobilization technique.**

By heating, in tank solidification, using zeolites, calcinations and vitrification.

1. **How heating method is involved in Immobilization technique?**

The radio wastes may be heated with sulphur and pitch. The solid obtained is mixed with cement and water brief and allowed to settle. This method is mainly used for intermediate radioactive wastes.

1. **Write a note on In-tank solidification.**

The liquid worth in evaporated to a solid cake and left in the underground container. The main drawback of this process is that the solid cake in freely soluble in water and may be washed away when it comes into contact with underground water.

1. **How zeolites are used in immobilization technique?**

Certain natural and synthetic zeolites may fix a given radioactive nuclide by Base Exchange or by accommodating them in appropriate channels in their structure. However, the method is extremely selective.

1. **What is meant by Calcination?**

High level radioactive waste may be dried or Calcination either alone or with additives. Calcination involves the heating up of the waste materials with or without additives to certain temperature and the ingredients react with each other to form inert material.

1. **Write a note on Vitrification.**

Recently BARC (Bhaba Research Centre) initiated the CGCRI (Central Glass and Ceramics Research Institute) to undertake a project work for solidifying radio wastes in the form of glass and to work and their mechanism of the process associated with conversion of radioactive wastes into glass at high temperature.

1. **Define Artificial Transmutation of elements.**

The conversion of one element into another by artificial means is known as artificial transmutation of elements.

1. **Define Transmutation of elements.**

Conversion of one element into another is known as transmutation of elements.

1. **What is meant by K - Capture?**

The nucleus of the atom captures an electron from its K-shell. This is called K-capture.

1. **State Columbic Repulsion or Columbic Barrier.**

When a nucleus is bombarded with an α particle, a proton or a neutron, which is a positively charged particle, it experiences a coulmbic repulsion or coulmbic barrier.

1. **What is Efficiency of nuclear reactions?**

The probability or efficiency of a nuclear reaction can be defined in terms of the number of particles emitted or the number of nuclei undergoing transmutation for a specified number of incident particles.

1. **Explain the term Nuclear Cross Section.**

The probability or efficiency of a nuclear reaction is also defined by another term called nuclear cross section.

1. **What are the factors that depend on the value of the nuclear cross section?**
2. The nature of the target element
3. The particular reaction under consideration and
4. The energy of the incident particle
5. **What is Controlled Fission Reaction?**

Atom bomb explosion is due to an uncontrolled chain reaction. If this chain reaction is put under control, after sometime, a steady state is established. When such a steady stat is established the number of neutrons produced and the number of neutrons consumed becomes nearly equal. The energy produced attains a constant level. Such a reaction is known as controlled fission reaction.

1. **What are components of a nuclear reactor?**

The components of nuclear reactor are

1. Core
2. Moderator
3. Control rods
4. Coolant
5. Shielding or protective screen
6. **What is meant by Thermo - Nuclear reaction?**

Nuclear fusion can take place by allowing highly accelerated protons and deuterons etc, to fall on nuclei of lighter elements. Such processes occur at reasonable rates only at very high temperatures of the order of a million degree centigrade which exist only in the interior of stars. Therefore, such processes are called thermo-nuclear reaction.

1. **Explain the term Thermo – Nuclear Energy.**

The thermo nuclear reactions among nuclei of hydrogen isotopes, deuterium and tritium, can serve as possible sources of energy on earth as these can occur more rapidly, provided the temperature is very high such an energy obtained from thermonuclear reactions is called thermo nuclear energy.

1. Distinguish between nuclear fusion and nuclear fission.

|  |  |  |
| --- | --- | --- |
| **S.No** | **Nuclear Fission** | **Nuclear Fusion** |
| **1** | Fission involves the breaking up of a heavy nucleus into lighter nuclei. | Fusion involves combining of two lighter nuclei into one heavy nucleus. |
| **2** | The links of the fission process are neutrons. | The links of the fusion process are protons. |
| **3** | Fission proceeds with thermal neutrons where thermal means room temperature. | Fusion proceeds with thermal particles where thermal means millions of degree in Kelvin scale |

1. **Distinguish between Radioactive isotope and non-radioactive isotope.**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Radioactive isotope** | **Non radioactive isotope** |
| **1** | Detection and qualitative estimation is very easy. | Detection and qualitative estimation is very difficult. |
| **2** | They survive for a very short time (half-life period is very small). | They serve for a very long time. |
| **3** | They are readily available for a large number of the elements. | They are not readily available for a large number of elements. |
| **4** | They are harmful to the operator and to which it is injected. | They are not harmful at all. |
| **5** | They follow a sequence of changes. | They do not follow a sequence of changes. |

1. **What are the various methods used to detect the Isotopes?**
2. Photographic measurement method.
3. Electroscope method
4. Ionisation chamber method
5. Geiger-Muller tubes method and
6. Scintillation counters method.
7. **State the uses of Isotopic dilution method.**
8. Zn, Cu, Hg and other cations have been determined by this method.
9. This method is used to analyse the mixture of amino acids obtained by hydrolyzing proteins outside the body using labeled aminoacids containing N15 to act is the tracer.

**57.What are called Fossil Fuels?**

Crude petroleum, coal and natural gas are called fossil fuels.

**58.Define Fuel.**

A substance which is used to produce heat energy is known as a fuel.

**59.What are the essential criteria for a fuel?**

1. The heat content of fuel should be high.
2. The fuel should not give undesirable by products and should not result in the formation of ash or smoke.
3. It should be cheap.

**60. What are the different types of fuel?**

1. Solid fuel
2. Liquid fuel and
3. Gaseous fuel

**61.How Coal is formed?**

Coal is formed by the slow carbonization of vegetable matter buried underneath the earth centuries ago in limited supply of air under high temperature and pressure prevailing there.

**62.What are the various varieties of Coal?**

During carbonization of vegetable matter, different varieties of coal are formed at different stages. They are

1. Peat (60% carbon)
2. Lignite (70% carbon)
3. Bituminous coal (78% carbon)
4. Semi-bituminous coal (83% carbon) and
5. Anthracite (90% carbon)

**63.What are the uses of coal?**

1. It is used mainly as fuel.
2. It is used for the manufacture of coal gas and various by products such as coke, ammoniacal liquor and coal tar. This coal tar is the source of a variety of organic compounds such as dyes explosives etc.
3. It is used in the manufacture of fuel gases such as producer gas, water gas and semi water gas.
4. It is used in the manufacture of synthetic petrol by catalytic hydrogenation of coal.

**64.What is Petroleum?**

It is a crude oil occurring in nature from which very important products such as petrol, kerosene, diesel, and many petrochemicals are obtained.

**65.Write the composition of petroleum.**

The crude petroleum contains alkanes (C1 to C40) cyclo alkanes or naphthenes and aromatic hydrocarbon.

**66.What are the theories to explain the formation of petroleum.**

1. Carbide theory (Inorganic origin)
2. Engler’s theory (Organic origin)
3. Modern theory

**67.What is Refining?**

The fractional distillation of the oil into different important fractions and the removal of undesirable materials are known as refining.

**68.What is Cracking?**

It is the process in which high boiling fractions of petroleum consisting of higher hydrocarbons are heated strongly to decompose them into lower hydrocarbons with low boiling points. The process involves cleavage of carbon-carbon and carbon-hydrogen bonds. It results in the formation of smaller molecules of various types depending upon the conditions employed.

**69.What are the types of cracking?**

1. Steam cracking
2. Hydro cracking
3. Catalytic cracking

**70.State the importance of cracking.**

Crude petroleum contains only a small percentage of petrol. The yield of petrol from petroleum is increased by cracking.

**71.What are called gaseous fuels?**

Fuels that are gases are called gaseous fuels.

**72.Write the composition of gaseous fuel.**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **Fuel** | **Composition** |
| 1. | Natural gas | The first six alkanes, mainly methane. |
| 2. | Gobar gas | Mainly methane and a little ethane. |
| 3. | Coal gas | Hydrogen, CO and methane. |
| 4. | Water gas | CO and H2 |
| 5. | Producer gas | Co and N2 |
| 6. | Liquefied petroleum gas (LPG) | Propane, propylene, n-butane, isobutene and butylene. |

**73.What are the advantages of gaseous fuels?**

1. They leave no residue.
2. They produced no smoke.
3. They possess high calorific values.
4. They readily flow-through pipes and tubes.
5. They can be easily ignited.
6. Complete combustion is possible.

**74.Write a note on Calorific value of fuels.**

The calorific value of a fuel is the quantity of heat produced by a given mass of the fuel on complete combustion. In the S.I system it is measured in kilojoules per kilogram. In C.G.S units it is in calories per gram. The calorific value is an important criteria of all fuels.

**75.What are the uses of gobar gas?**

1. Used as a domestic fuel.
2. Used as an illuminant.
3. Used to rum diesel engines.

**76.State the uses of coal uses.**

1. It is used as cheap industrial fuel.
2. It is used for heating and lighting purposes.

**77.State the uses of water gas.**

1. It is used for welding purposes.
2. It is a source of industrial hydrogen.
3. It is used in the manufacture of methyl alcohol and for making carbureted water gas.

**78.Write the composition of carbureted water gas.**

Hydrogen - 30-40%

Hydrocarbons - 15-20%

Carbon monoxide - 20-30%

Nitrogen - 5%

Carbon dioxide - 2%

**79.What is Diluting gas?**

Water gas is used to dilute the coal gas where both plants are used side by side. So water gas is called a diluting gas.

**80.What is meant by Carburetting?**

Water gas has a much lower calorific value than coal gas. So thus must be enriched when Gaseous hydrocarbons are added to water gas. This process is known as carburetting.

**81.What are the uses of carbureted water gas?**

1. It is used for lighting purpose also.
2. It is used as industrial fuel.

**82.Write the composition of semiwater gas.**

Nitrogen - 55%

CO - 30%

Hydrogen - 15%

CO2 - 10%

Methane - 2%

**83.Mention the uses of semiwater gas.**

1. It is used as a fuel in the steel industry.
2. It is also used for the production of power in internal combustion engines.

**84.States the uses of producer gas.**

1. It is used as a gaseous fuel.
2. It is s an industrial fuel.
3. It is used to run motor engines.
4. It is used as an illuminant.

**85.What are the advantages of LPG?**

1. They possess high calorific value.
2. They leave no residue.
3. They produce no smoke.
4. They readily flow through pipes and tubes.
5. They can be easily ignited.
6. Complete combustion is possible.

**86.Define Fertilizers.**

Fertilizers are substances which are added to the soil in order to remove the deficiency of essential elements required to the plants.

**87.Which is known as primary nutrients?**

Nitrogen, phosphorus and potassium elements are known as primary nutrients.

**88.What are the chief requisites of a fertilizer?**

1. It must be soluble in water.
2. The fertilizer must be converted into a form that the plant can assimilate by rain or water.
3. It must be dry, finely powdered and stable. (i.e available for a long time).
4. It should be very acidic.
5. It should not contain anything injurious to plants.
6. It should be cheap.

**89.Write some examples for Nitrogen fertilizers.**

Basic calcium nitrate, Ammonium nitrate, Ammonium sulphate, Calcium ammonium nitrate, Urea, Calcium cyanamide or Nitrolim

**90.Write some examples for Phosphorus fertilizers.**

Super phosphate of lime or calcium super phosphate, Triple super phosphate, Phosphatic slag or Thomas slag.

**91.Write some examples for potassium fertilizers.**

Potassium chloride, potassium nitrate or Saltpeter, potassium sulphate

**92.Write some examples for mixed fertilizers.**

Ammoniated super phosphate, calcium super phosphate nitrate, Ammonium phosphate sulphate, mono ammonium phosphate.

**93.What are called NPK fertilizers?**

Fertilizers that contains N,P and K in proper proportions produce much better results. Such fertilizers are known as NPK fertilizers.

**94.What are the advantages of NPK fertilizers?**

1. They produce better results.
2. They remove the deficiency of N,P and k by a single application.

**95.What are called Micro nutrients?**

Some elements are not required in large quantities as N,P and K. So these are called Micronutrients. E.g., iron, calcium, magnesium, boron, manganese, copper, sulphur, molybdenum and chlorine.

**96.Explain the role of micro nutrients in plants.**

1. Iron helps the synthesis of chlorophyll. It helps the oxidation reduction process in respiration.
2. Copper acts as a catalyst for respiration.
3. Boron promotes protein synthesis.
4. Manganese helps photosynthesis.
5. Molybdenum helps in fixation of nitrogen.

**97.What are safety matches?**

A splint of wood or cardboard or a piece of waxed thread or paper with a combustible tip which ignites by friction is called a match. It is the most widely used agency for obtaining fire.

**98.What are Fire works?**

Fire work is a device for producing various effects of lighting by means of combustible, explosives etc. It is used for display and also as signals. It is also known as pyrotechny.

**99.What are the classes of fire work compositions?**

1. Force and sparks
2. White or coloured flame
3. Noise
4. Dense cloud of smoke (e.g., smoke bombs for military purposes and
5. A whistling sound (rockets)

**100. Write a note on salts and colours which impart to the fire works.**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Salts** | **Colour** |
| 1. | Potassium nitrate, antimony salt or arsenic and sulphur | White fire |
| 2. | Strontium salts | Red |
| 3. | Barium salts | Green |
| 4. | Sodium salts | Yellow |
| 5. | Copper salts | Blue |
| 6. | Magnesium powder | Brilliant white |

**101. Write a note on Explosives.**

Explosives are substances capable of exerting sudden pressure on their surroundings. This sudden pressure is due to the rapid conversion of some substances in the explosives into hot gases or volatile products. These gases and volatile substances are responsible for the sudden pressure. At the instant of their formation the gases occupy only the volume of the explosive. So high pressure develops inside the explosive. In the process heat is also generated. So an explosion takes place.

**102. What are the basic requirements of an explosive?**

1. It must contain a substance or a mixture of substances which remains unchanged under ordinary conditions but undergoes a fast chemical change when stimulated.
2. This reaction must yield gases whose volume under normal pressure and at high temperatures. (i.e., during explosion) is much greater than that of the original substance.
3. The reaction must be exothermic so that the heat produced increases the pressure of the product gases.

**103. How explosives are classified?**

Explosives are classified into

1. Propellent explosive
2. Detonating explosive

Detonating explosives are further classified into

1. High explosive (b) Primary explosive

High explosives are subdivided into

1. Military high explosive
2. plasting explosive

**104. Write a note on Dynamites.**

Most of the explosives contain nitroglycerine or other similarly behaving nitric esters. These are the sensitizers and they ensure detonation of the mixtures. Guhr dynamite, straight dynamite, gelatin dynamites, blasting gelatin, ammonia dynamites are some of the useful dynamites.

**105. Which chemicals are used in the preparation of Military explosives?**

TNT (Tri nitro toluene), Picric acid (Tri nitro phenol).

**106. Define Paints.**

Paint may be defined as a fluid suspension of finely divided solids which when applied to a surface will dry or set to an opaque film either by oxidation or evaporation.

**107. What are the qualities of a good paint?**

1. It should be easily applied.
2. It should cover the surface well.
3. It should be opaque and
4. It should possess good hiding power.

**108. Name some important varieties of a paints.**

1. Ready mixed paint
2. Enamel or varnish paint
3. Anticorrosion paints
4. Metallic paints

**109. Write a note on Pigments.**

These are finely divided insoluble white or coloured powders obtained from naturally occurring earth colours or prepared by chemical manufacturing processes. In the manufacture of paint, it is essential that the colours or pigments used should be in the form of a fine dry powder. This is done by grinding and sieving processes. The size of the final particle is less than two microns(colloidal size).

**110. Which pigments are commonly used in the manufacture of paints?**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Pigment Colour** | **Name of the chemicals** |
| **1.** | White pigments | Basic carbonate and basic sulphate, white lead, zinc oxide, titanium oxide, lithophone etc. |
| **2.** | Yellowpigments | Lead chrome, zinc chrome yellow etc. |
| **3.** | Blue pigments | Ultramarine, iron blue (Prussian), cobalt oxide, copper phthalo cyanine etc. |
| **4.** | Green pigments | Chrome-green (iron blue –chrome – yellow) Chromium oxide and hydroxide etc. |
| **5.** | Red pigments | Iron oxide, red lead etc. |
| **6.** | Black pigments | Carbon black, lamp black, bone black etc. |
| **7.** | Metallic powders. | Aluminium, copper, zinc, lead etc. |

**111. What are called Varnishes?**

A homogeneous liquid, which when thinly applied and exposed to air dries to a hard film giving decorative effect and protective action to the surface to which it is applied is called a varnish.

**112. Define “monomer”**

Lower molecular weight compounds having the functionality of two or more compounds are called monomer.

**113.Define “polymer”**

They are complex and giant molecule polymers can have different chemical structures, physical properties, mechanical behavior, thermal characteristics.

**114.What is functionality?**

Each molecule of the compound should have the capability to react at least with two other molecules of the same or other compound.

**115.What is repeating unit?**

Repeating entities are called repeat unit.

**116.Define “degree of polymerization”**

The number of repeating units denotes degree of polymerization.

**117.What are linear polymers?**

Those polymer have a linear skeletal structure, which may be represented by a chain with two ends.

**118..What are branched polymers?**

It have side chain or branches. Which are bonded to the main chain at branch points.

**119.Define “network polymers”**

They have three dimensional structure in which each is connected to all others by a sequence of junction points.

**120.What is homo polymers?**

It is a polymer derived from one species of monomer. It contains single type of repeat unit.

**121.What are copolymer ?**

It is a polymer derived from more than one species of monomer. It means polymer molecules contain two or more different types of repeat unit.

**122..What are statistical copolymers?**

Statistical copolymers are copolymers in which the sequential distribution of the repeat units known statistical laws.

**123.Define “random copolymers”**

It is a special type of statistical copolymer in which the distribution of repeat units is truly random.

**124.What are alternating copolymers?**

It have only two different types of repeat unit and those are arranged alternately along the polymer chain.

**125.What are block copolymers?**

Linear copolymers in which the repeat units exist only in long sequences or blocks, of the same type.

**126.Define Graft polymers.**

Graft copolymers are branched polymers in which the branches have a different chemical structure to that of the main chain.

**127.What is thermoplastics?**

Thermoplastics are linear or branched polymers which can be melted upon the application of heat.

**128.What are thermosetts?**

Which on heating sets into a mass and once set cannot be reshaped. Such polymers, that become an infusible and insoluble mass on heating , are called thermosetts.

**129.What are condensation polymer?**

It is obtained by the random reaction of two molecules.

**130.What are elastomers?**

When vulcanized into rubbery products exhibiting good strength and elongation polymers are used as “elastomers”.

**131.What is addition polymer?**

Sequential addition of monomer or just add to give polymer.

**132.What are poly disperse polymer?**

Those polymers having the ratio Mw/Mn must be greater than unity.

**133.What is mono disperse polymer?**

Those polymer would have mw/mn =1.00

**134.Define “chain growth polymerization”**

Polymerization in which a polymer chain grows only by reaction of monomer with a reactive end-group on the growing chain are known as chain-growth polymerization.

**135.What is step growth polymerization?**

Polymerizations in which the polymer chains grow step-wise by reactions that can occur between any two molecular species.

**136.What is linear step polymerization?**

Step polymerizations involve successive reactions between pairs of mutually reactive functional groups.