Problem Statement-1

Sr. No.	Particulars	Details
01.	Introduction	Peanuts contain high amount of protein (26%) and protein content is increased in the groundnut meal after extraction of oil from it. The proximate analysis of the de-fatted peanut meal indicated that it contains 47–55% high quality protein. Peanut protein can be isolated from defatted peanut meal by alkaline isoelectric precipitation and physical separation procedures. Peanut protein isolate can exhibit a solubility profile similar to that of peanut flour, with minimum solubility observed at pH 3.5–4.5 and maximum solubility at pH 10 and higher. Roasting of peanut can reduce all functional properties of defatted peanut flour. Thus peanut protein isolation can prove useful in food formulations. It can be a good source of protein fortification for a variety of food products for protein deficient consumers in developing countries as well as a functional ingredient for the peanut industry. The production of peanut protein isolates could also add value to de-fatted peanut flour, a low value by-product of peanut oil production.
02.	Expected Outcome	Development of a cheaper and more viable industrial process for protein extraction. Reduction/utilization of the waste material from the oil industries. Source of cheaper protein for the people below the poverty line.
03.	Problem Statement	Extraction of vegetable protein from the spent oil cakes of groundnut at a low cost.

Problem Statement-2

Sr. No.	Particulars	Details
01.	Introduction	Mequinol, MeHQ or 4-Methoxyphenol is an active ingredient and used in dermatology. It is employed as a pharmaceutical drug in skin depigmentation. It is used as polymerization inhibitors. For example, in the radical polymerization of acryaltes and styrene monomers. Industrially, the majority of mequinol is produced from p-benzoquinone and methanol via a free radical reaction. However, this synthetic route requires a lot of control and complexity of the reaction is also high. Development of the alternative synthetic route for the manufacturing of mequinol with regio-specific reactions could lead to the cheaper manufacturing process for large scale industrial production of mequinol.
02.	Expected Outcome	Industrial process for the bulk-production of mequinol with non-patented novel synthetic route. Reduced production cost for mequinol

03.	Problem Statement	Finding the alternate efficient synthetic route for the industrial scale manufacturing of Mequinol (4-methoxyphenol).

Problem Statement-3

Sr. No.	Particulars	Details
01.	Introduction	Fly ash is a coal combustion product that is composed of the particulates (fine particles of burned fuel) that are driven out of coal-fired boilers together with the flue gases. Ash that falls to the bottom of the boiler's combustion chamber (commonly called a firebox) is called bottom ash. In modern coal-fired power plants, fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys. Depending upon the source and composition of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO_2) (both amorphous and crystalline), aluminium oxide (Al_2O_3) and calcium oxide (CaO), the main mineral compounds in coal-bearing rock strata. The minor constituents of fly ash depend upon the specific coal bed composition but may include one or more of the following elements or compounds found in trace concentrations (up to hundreds ppm): arsenic, beryllium, boron, cadmium, chromium, hexavalent chromium, cobalt, lead, manganese, mercury, molybdenum, selenium, strontium, thallium, and vanadium, along with very small concentrations of dioxins and PAH compounds. It also has unburnt carbon. Majority of it is recycled, often used as a pozzolan to produce hydraulic cement or hydraulic plaster and a replacement or partial replacement for Portland cement in concrete production. Pozzolans ensure the setting of concrete and plaster and provide concrete with more protection from wet conditions and chemical attack. Due to the major portion of silicon dioxide (SiO_2) (both amorphous and crystalline) and aluminium oxide (Al_2O_3) in its composition, the fly ash has potential to be used as material for the development of many composite materials. Also, it is easy to convert fly ash into the porous catalyst substrate suitable for various organic transformation reactions and pyrolysis reactions.
02.	Expected Outcome	Better fly ash waste management by turning it into the value added products Development of cheaper and light weight composite materials with improved strength Exploration of new cheaper substrate for the development of various heterogeneous catalysts
03.	Problem Statement	Using fly ash into the development of the value added products like light weight polymer composites or catalyst substrates

Problem Statement-4

Sr. No.	Particulars	Details
01.	Introduction	In general, nanostructured materials with specific size, shape and geometry have unique and different properties from bulk materials. Using reaction media with nanometer and micrometer dimensions, they can produce new nanomaterials with interesting and remarkable properties. In general, nano-reactors are nanometer-sized chambers in which chemical reactions can take place. Of course, nanoreactors are somehow part of the reaction, and this is the main difference between them and microreactors. One of the useful solutions to achieve the environment of nanoreactors is the use of porous materials, so due to the importance of nanoreactors, porous structures are among the most prominent and widely used compounds in this group. Performing chemical reactions in confined spaces with nanometer dimensions and micrometer volume leads to changes in the kinetics and the whole process path. Such confined spaces that are used to perform specific chemical reactions are called Nano-reactors. Nano-reactors are very small nanometer-sized containers that have great potential for improving chemical conversions in chemicals by protecting catalysts from environmental influences as well as confining reactors and catalysts in a small space for a long time. Which is one of their dimensions at the nanoscale at the same time, it is based on the same principle in the cells of living organisms.
02.	Expected Outcome	Development of new and efficient porous materials in the category of nano-reactors Application of nano-reactors in organic transformation reactions
03.	Problem Statement	Development of porous materials for the application as molecular nano-reactors

Problem Statement-5

Sr. No.	Particulars	Details
01.	Introduction	Plastic material is easy to use and we can find it in more than 70% of things that we commonly use. However, plastic is also considered a hazardous waste that is accumulating in our surroundings. Plastic polymers are non-biodegradable, toxin carriers and are danger to animals if consumed. According to the Central Pollution Control Board (CPCB), India generates 5.6 million tons of plastic waste annually and only 60% of this is recycled currently. While there are eco-friendly substitutes for some plastics, they are not as versatile or durable as plastics. So we have no option other than continuing the use of plastic, but reduce its usage in our daily life. However, we can increase the reuse and recycling of plastic waste generated. The idea of converting the plastic waste to petroleum is gain considerable attention via

		pyrolysis. The process involves pyrolysis of waste plastics, where plastic's organic molecules are broken down due to high temperatures and catalytic conversion, followed by condensation to liquefy to get liquid petroleum or aromatics. Polyolefins like polyethylene and polypropylene, the main raw material for producing petrol and other products, account for 65-70% of the typical plastic waste material fed into the process. From one kg raw poly-olefinic plastic, around 650-700ml petrol or 850ml diesel or 450-500ml aromatics along with LPG as a byproduct could be produced. In their approach, the plastic waste is heated to about 400-500 degrees celsius over a suitable catalyst. This causes the long chain polymer chains to break apart in a process known as "thermo-catalytic degradation". This process produces large quantities of much smaller, organic molecules. Development of efficient catalysts for this thermo-catalytic degradation will improve the % conversion of plastic into the liquid fuels and aromatics. Also, the structural modification of the catalyst also holds the promise of furnishing variety of aromatic hydrocarbons.
02.	Expected Outcome	Development of novel heterogeneous catalysts for the thermo-catalytic degradation of plastic waste Modification of the catalyst for the selective formation of liquid fuel or aromatic hydrocarbons Improvement of the catalyst to offer better cracking yield for liquid fuel
03.	Problem Statement	Development of a novel heterogeneous catalyst for the pyrolysis of polyethylene plastic material into liquid fuel and aromatics

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