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Editorial

Pharmaceutical chemistry specialization in pharmaceutical sciences

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Abstract

There is much attention attracted to Masters (Post Graduation) in Pharmaceutical Chemistry after bachelor's academic qualification in Pharmaceutical Sciences, post Higher Secondary qualification in India. However, as we think Pharmaceutical Chemistry as defined by many of the scientist and highly educated academicians in Pharmaceutical Sciences or Pharmacy in India, is not only a single branched and comprises of 8 -10 branches under its aegis. At Post graduation level in Pharmaceutical Chemistry, the area of thesis decides the candidate's specialization. This editorial gives in brief idea about the various branches of Pharmaceutical Chemistry and concerned Thesis areas as specialization area as designatory educational line in candidates academic record.

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1. Introduction

There are at total 17 specializations in Pharmacy and Pharmaceutical Sciences at Masters level. Masters in Pharmaceutical Chemistry specifically M.Sc (Master of Science), M.S. (Master of Science) and M.Pharm (Master of Pharmacy) are specializations in Pharmacy or Pharmaceutical Sciences. However, candidate seeking education at specialization level in Pharmacy or Pharmaceutical Sciences can secure admission in both programmes. Both are considered as valid qualification after bachelor's in pharmacy or pharmaceutical sciences. It is one of the toughest courses in graduation and post-graduation level with high paid jobs at academia and pharmaceutical industries.

2. Majors at Specialization Level

1. **Advanced medicinal chemistry:** This is advanced stage study of Medicinal Chemistry meaning chemistry of medicines. Which has two interfaces, as per described in previous editorials such as Chemical Interface and Biological Interface. At chemical interface it encompasses basic principles of organic chemistry and all such applied chemistries useful for the synthesis of bioactive compounds i.e. compounds with biological activity or more properly called as pharmacological property. At Biological Interface it encompasses basic principles of medicine and its chemistry including human and veterinary medicine. These may also be applied principles at biological interface such as pharmacological principles (pharmacology and toxicology and basics of clinical pharmacology), biochemical principles (biochemistry), bioorganic chemistry, pharmacological chemistry and principles or statistics as well as applied biological sciences with chemical approach. As assumed by many M.Pharm in Pharmaceutical Chemistry is valid qualification for Lifesciences as well as Chemical Sciences and merely not Organic chemistry.

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2. **Stereochemistry of drugs (Medicines):** This is applied stereochemistry branch specifically applied to the study of the medicines and its biological action.

3. **Chemistry of natural products:** This is somewhat similar to Pharmacognosy or more spiritedly called as Herbal Medicine. It encompasses the principles of natural product chemistry, which is chemistry of naturally occurring products which has medicinal values. At research level, this field has developed 90% of the new generation ayurvedic medicines in current times.

4. **Phytochemistry and phytomedicine:** The difference between Phytochemistry and Phytomedicine and Chemistry of Natural Products being the later encompasses the active ingredients and the former encompasses metabolites and active constituents in chemical nature.

3. Modern Pharmaceutical Analytical Techniques

As per Pharmacy council of India this is common subject for most of the specializations. It encompasses the modern analytical techniques including ELISA, RIA, MRI, CT scan technique principles. However more focused on the assay of chemical constituents in Pharmaceutical Formulations and crude and raw drug materials, etc. Indeed, a need of hour for every specialized candidate.

The main focus of this article being making the reader aware that Pharmaceutical Chemistry is broad specialization and the candidate's specialization is decided over the area of the Thesis. The same can be inscribed or written as a field of specialization in M. Pharm degree for example M.Pharm (Medi. Chem.) indicating the candidate is Masters in Pharmaceutical Chemistry with Thesis in Medicinal Chemistry. So, coming back to the point, the 8-10 branches of Pharmaceutical Chemistry are as follows:

3.1. Medicinal chemistry

This is pharmaceutical chemistry's core research area with basic focus on study and research in the applied area of pharmaceutical organic chemistry, pharmacology, toxicology, biochemistry, pathophysiology or human / veterinary pathology , clinical biochemistry and mainly more in terms of research and as per notations of esteemed Indian Council of Medical Research, Ministry of Health of Family Welfare called as Drug Chemistry (Masters with medicinal/ pharmaceutical chemistry can avail opportunity at Indian Council of Medical Research for job perspectives including at CSIR , CDRI and government ministries laboratories in India , abroad and also mostly work as Pharmacologists , of course professionally specialized degree holders are Clinical Pharmacologists need not to say that they should strictly hold a Bachelors in Medicine. And many MNCs such as esteemed Tata Consultancy Services hire M. Pharm Specially in Medicinal Chemistry thesis for clinical Regulatory affairs as well as Pharmacovigilance related jobs. One may look it as Medicinal Chemistry or Pharmaceutical Chemistry but mainly it is based and study or Pharmacological Chemistry or precisely called as Molecular Pharmacology including Pre and Clinical aspects.

3.2. Enzyme Catalysis / Enzyme Chemistry (Bio-organic Chemistry/ Biochemistry):

There are candidates experimenting and researching in the field of enzyme chemistry at research level of Post Graduate thesis in Pharmaceutical Chemistry and duly notified as M. Pharm in Bioorganic Chemistry or Enzyme Chemistry and should be equivalented with M.Sc in Clinical Biochemistry by Pharmacy Council of India, so that the specialized fellows can start their own Biochemistry Laboratory. Need not to say that professionally acquired qualifications in broad specialization with research in biochemistry need not be necessarily bachelor's in medicine to so called designate oneself as Clinical Biochemist.

3.3. Synthetic organic chemistry including all synthetic techniques

They have good opportunities in Central Scientific and Industrial Research (CSIR) laboratories such as National Chemical Laboratories and other apex Institutes of national importance such as Central Drug Research Institute (CDRI., Lucknow). As previously exemplified that the research thesis component of M. Pharm in Pharmaceutical Chemistry consists of major in Organic Synthesis with Wet Laboratory however devoid of Pharmacological Studies (pre-clinical or clinical). Their research component mainly focuses on synthetic principles of drugs or New Chemical Entities (NCEs). Most of them find Jobs in Synthetic Research and Development Jobs

3.4. Computational chemistry

This is new and advanced area of research. This technique consists of use of software's of Drug Design for more focused drug discovery. Mainly if this research is accompanied with chemical synthesis and pharmacological and toxicological evaluation and when it culminates in typical hit or lead discovery research for drug discovery it is called as Medicinal Chemistry and when devoid of synthesis and Pharmacological Screening it is more profoundly called as Molecular Pharmacology. However devoid of synthesis and pharmacological screenings it is just Masters in Pharmaceutical Chemistry with specialization in Computational Chemistry. Most of them find jobs in dry (computational laboratories). Wherein most of them work on principles of CADD and Quantum and Molecular mechanics for integrated drug discovery.

3.5. API Synthesis and product development

The area of research in the thesis includes development of New Synthetic routes to the existing bulk manufacturing of chemicals or pharmaceutical drugs. Mostly competed by

synthetic chemists in science specializations but competent enough to handle API research and development in area of pharmaceutical product development. Most of them find Jobs in Synthetic Research and Development Jobs

3.6. Phytochemistry

More like Phytochemistry with research area of Thesis or Dissertation in chemistry of natural products with more intense studies on markers and metabolic pathways and active metabolites of metabolic pathways of herbal origin.

3.7. Phytomedicine

More profoundly at research level during their post-graduation thesis they work on herbal medicine principles studies or pharmacognostic importance. More precisely herbal medicine or Herbal Drug Discovery.

3.8. Pharmaceutical analytical chemistry

Includes principles of Modern Pharmaceutical Instrumental Assaying techniques at research level during their post graduate degrees in Pharmaceutical Chemistry specialization. They find scope in Pharmaceutical Analytical Laboratory of commercial origins with huge annual salaried perks and packages. Hon. Home Ministry of India has special provisions for this specialization in Forensic Laboratories of Central and State Government respectively.

3.9. Pharmaceutical bioanalytical chemistry

The area of research for thesis includes analysis of drug and components or any other assay in biological fluids of human and veterinary origin.

3.10. Herbal drugs / Natural medicinal products chemistry

May include research area in Pharmaceutical Chemistry with isolation only or isolation of active chemical components and pharmacological screening.

***Any other research area not included here as deemed fit by the University/ Research Guide*., may be called as specialization confined to the aegis and scope of Pharmaceutical Chemistry broad specialization.**

Whatsoever your specialization area may be, Hon. Ministry of Health and Family Welfare (MoHFW) in India recognizes it as Drug Chemistry to offer Fellowships of diverse nature to Pharmaceutical Chemistry Post Graduation Post Bachelors in Pharmacy and Pharmaceutical Sciences and many other Hon. Ministries in India for job perspectives.

Note: Specializations are serially inscribed and do not mean a hierarchy in status of Pharmaceutical Chemistry.

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