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Higher education benefits of 'Industrial Chemistry' ascore module

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ABSTRACT

An industrial chemistry degree as core module is setting out basics and hands-on application of many chemical principles, procedures and research activities through small scale projects to students training through tie up with chemical industry to improve student level skills. A refresher in-service training course and intensive in-service training workshop whose goal is to train teachers to use interdisciplinary approach effectively when teaching the industrial chemistry case study syllabus. It is suggested that in-service teacher training courses include a broad spectrum of instructional techniques which will enable teachers to vary their classroom procedures and to plan newstrategies for classroom implementation of industrial chemistry case studies along with research projects. The curricula of higher education courses in industrial chemistry aims, to develop students skills necessary for further studies and, on the other hand, to respond the need of endowing future professionals of knowledge to analyze andsolve multidisciplinary problems in a sustainable way. Industrial chemistry beneficiaries in various career titles including teaching, research scientist, development chemist, plant manager, production manager, operations manager.

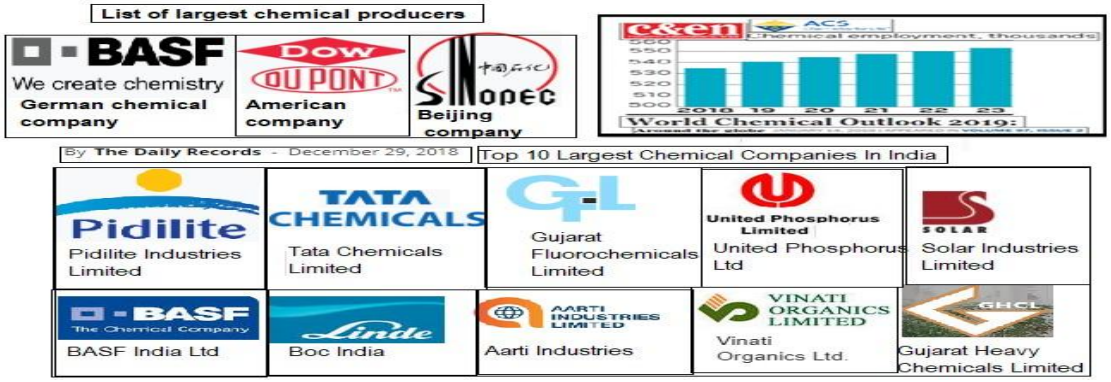
INTRODUCTION

India has the third-largest higher educational system in the world. Chemistryas subject with its vast application has got lot of attention right from school to higher studies and considered as "Chemistry in day today Life" and many more quotes.

Highlights of India's education sector:

1. India is the single largest provider of global talent, with one in four graduates in the world being a product of theIndian system.
2. India is among top 5 countries globally in cited research output, its research capabilities boosted by annual R&Dspends amounting to over US$140 billion.
3. India is in the fourth cycle of its research excellence framework, with at least a 100 of Indian universities competingwith the global best.
4. 23 Indian universities are among the global top 200, going from none two decades ago.
5. In the last 20 years alone, 6 Indian intellectuals have been awarded the Nobel Prize across categories.
6. India is a regional hub for higher education, attracting global learners from all over the world
7. The country has augmented its GER to 50% while also reducing disparity in GER across states to 5 percentagepoints.
8. The Indian higher education system is needs-blind, with all eligible students receiving financial aid. Two-thirds ofall government spending towards higher education is spent on individuals, including faculty and students.
9. India's massive open online courses, started by several elite research universities, collectively enrol 60% of theworld's entire student population.
10. Indian higher education institutions are governed by the highest standards of ethics and accountability, with everysingle one of them being peer-reviewed and accredited.

An industrial chemistry subject opens opportunity comprises the companies that produce industrial chemicals. Central to the modern world economy, it converts raw materials (oil, natural gas, air, water, metals, and minerals) into more than 70,000 different products.As of 2018, the chemical industry comprises approximately 15% of the US manufacturing economic sector globally.As the world stands on the brink of the Fourth Industrial Revolution, powered by a wide range of new technology breakthroughs such as Artificial Intelligence Chemicals (AIC), Nano Smart Chemicals , new drugs discoveries and 3D printing polymer (3PP), major increase in employment are expected in the Chemical market globally in coming years (fig. below)



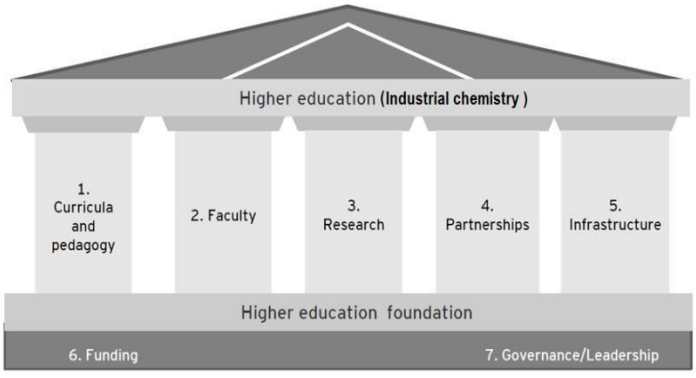
Given below are the college names, location and the average structure of the fees which will be taken by the college for this course.

COLLEGE NAME	CITY	AVERAGE ANNUAL FEE IN INR
Kuvempu University	Shimoga	INR 28,800
Government Arts and Science College	Karnataka	INR 7,500
Bhavnagar University	Bhavnagar	INR 25,000
Guru Nanak Dev University	Amritsar	INR 84,000
Indian Institute of Technology	Kharagpur	INR 79,000
Jiwaji University	Rajasthan	INR 9,000
Alagappa University	Karaikudi	INR 7,000
Gulbarga University	Gulbarga	INR 12,800
Dr. CV Raman University	Bilaspur	INR 51,500
Central University of Gujarat	Gujarat	INR 4,800
M.S. Ramaiah University of Applied Sciences	Bangalore	INR 40,000
National Institute of Technology	Warangal	INR 78,475
University of Lucknow	Lucknow	INR 74,750
Punjab University	Punjab	INR 52,350
Shivaji University	Kolhapur	INR 76,000
Uttaranchal Institute of Technology	Dehradun	INR 1,39,000
Uttaranchal University	Dehradun	INR 1,36,000
Noida International University	Uttar Pradesh	INR 1,51,000
Pacific University	Chandigarh	INR 70,000

2019 COUNTRY/REGION TABLE: INDIA

Institution name	2019 ranking
Indian Institute of Science	14
Indian Institute of Technology Bombay	27
Indian Institute of Technology Roorkee	35
Indian Institute of Technology Kanpur	=46
Indian Institute of Technology Kharagpur	55
Indian Institute of Technology Indore	61
JSS Academy of Higher Education and Research	=64
Indian Institute of Technology Delhi	66
Indian Institute of Technology Madras	=75

Schools, colleges opting science includingChemistry topic from school 10th, PUC, U.G P.G, Diploma, Medical and Engineering colleges is also seenall academic curricular board .Post graduate study exclusive for chemistry learning both theoretical and hand on experience in laboratory is essential to improve chemistry base. Science projects and exhibition to encourage young talents to explore various stream of field in Chemistry. Live online teaching for interaction with student from classnot only in cities but in rural sectors Virtual world National Informatics Centre helping publish research work with number of publication in chemistry .Since 1869 is considered as the year of discovery of the Periodic System by the Russian scientist, Dmitri Mendeleev. The IYPT 2019 also commemorates the 150th anniversary of the establishment of the Periodic Table of Chemical Elements was adopted by the UNESCO General Conference at its39th Session.



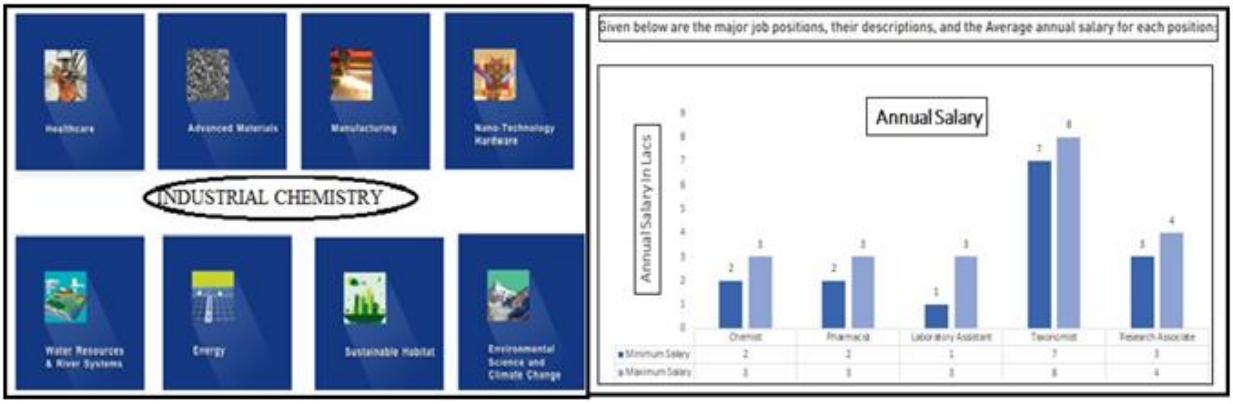
Industrial chemistry access to institutions for higher education, another issue is that a majority of the students are enrolled in undergraduate level programmes, compared to the Masters and the Doctoral programmes. Moreover, at the undergraduate level, there is a low pass-out rate -- out of 2,90,16,350 students enrolled at undergraduate level, only 6,419,639 passed-out in 2017.List of College offering Industrial chemistry coursein India listed above.

Success of Industrial chemistry:
The industrial chemistry department apart from its main tasks of involving itself

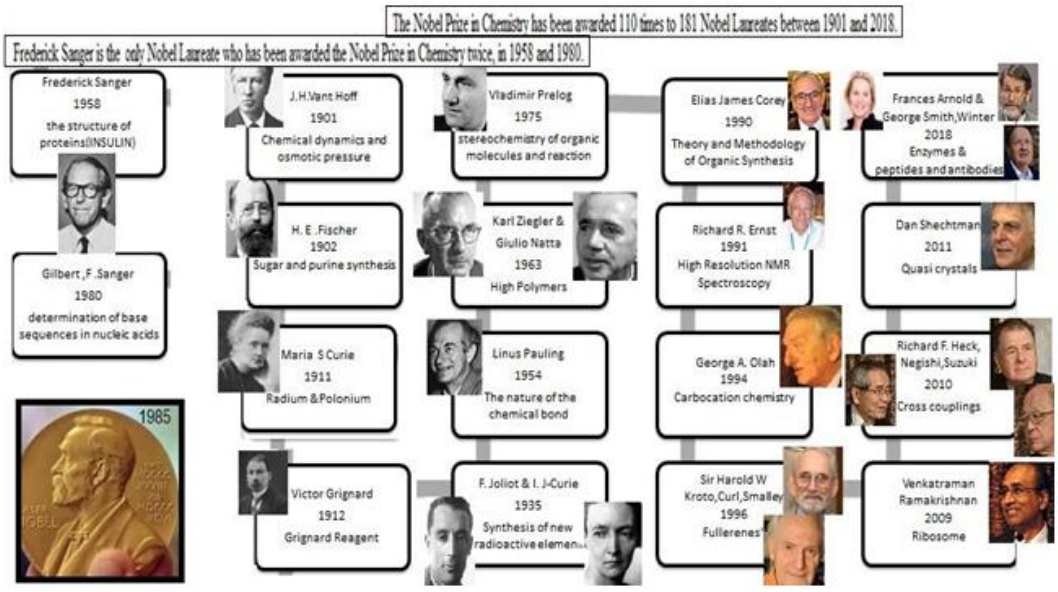
1. In academics, teaching and research as also periodically interacted and established a mutually beneficial relationship with the nearby industries.
2. In-service teacher training courses include a broad spectrum of instructional techniques and updated virtual and library infrastructure which will enable teachers to vary their classroom pedagogy and to plan new

strategies for classroom implementation of industrial chemistry basic case studies along with research projects.

3. In this direction the department has initiated several programs like, taking up Industries sponsored projects involving testing and analysis of raw materials and products, encouraging students to take up projects related to their studies to acquire work experience, inviting executives and technical staff of the Industries as guest faculty.
4. With the department extending its research facilities and expertise available within the department to nearby Industriesto give exposure to students.
5. In this context the department providing consultancy services in chemical testing. Under this programme the M.Sc.fresher's are getting training on stipendiary.
6. DST-FIST and NANO Mission, BRNS. etc.UGC projects, BSR(Basic Scientific Research),AICTE(All India Council for Technical Education),SERB(Science and Engineering Research Board) are encouraging to young chemistry students and research scholars gives roadmap for Research to solve major chemical and technical challenges in selected domains needed by the country.
7. Active participation of students through guidance of lecturers for poster presentation and oral in international andnational seminar is plus point of industrial chemistry success benefiting student knowledge and research basics tosurvive in global world.
8. Various organizations like Syngene Biocon Company, Bangalore, Grasim industry , BASF, Mangalore, Apotech Bangalore, Strides Arco lab, Mangalore and Vetcare, Bangalore, were visited the campus for the selection of the candidatesto adopt the students who are below the poverty line for P.G.
9. It is needless to say that all most all students will get good jobs immediately in various sectors serving trained manpower to take-up Chemists/Scientists positions in Industries and Institutions.
10. Graphical description of annual salary for each position figure below.



Remembering the Nobel laureates for dedicated work in Chemistry:



1. By 2030, India will have the largest population in the world, in the higher education age bracket. Increasingurbanization and income levels will drive demand for higher education.
2. India's economy is expected to grow at a fast pace; rapid industrialization would require a gross incrementalworkforce of ~250 million by 2030; India could potentially emerge as a global supplier of skilled manpower.
3. India has the opportunity to become a prominent R&D destination.
4. Given the expected socio-economic scenario in 2030, India would need a robust higher education system that candeliver on multiple imperatives.
5. A differentiated system of institutions with differing objectives and focus areas would be critical for achieving theproposed goals.

Market size of the Chemicals industry in India:

Market size of the Chemicals industry in India stood at $ 163 bn in 2017-18**.**Total production of chemicals and petrochemicals stood at 47,882,000 MT during 2017-18, a 2.62% increase over 2016-17. Alkali chemicals had the largest share in the Chemical industry in India with approximately 69% share in the total production. Production of polymers account for around 59% of total production of basic major petrochemicals.

CONCLUSION

The assessment of the role of Industrial chemistry in Higher Education courses stands for an inestimable achievement grabbing attention not only in India but globally. In order to have a true discussion about quality initiatives, dedication of student with competitiveness, creativity and theoretical with lab experience of the role of training on educational practice, these assets must be intertwined with an evaluation of the impact on the students' courses, giving the students a strong foundation in chemistry. Achieving the industry's ambitious growth targets will require a combination of company-level initiatives, industry-academic partnerships, wise investments, and greater international access.

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