Completion Report

(Sanctioned date to Completion date)

Department of Biotechnology

Proforma for submission of Completion Report supported under Star College Scheme

(Kindly note that the Completion report from Point 6 to 10, should not be more than 25 A4 size sheets, with fontsize 12pt and line spacing 1.5) Relevant annexure may be attached at appropriate places.

1. Name of the College : Shyam Lal College, University of Delhi

2. Name of Coordinator, designation, Address, Phone nos. — Dr. Ashu Gupta, Associate Professor, Department of Chemistry, Shyam Lal College; 9811624264

3. (A) Assessment duration : 29/02/2020 to 28/02/2023 (B) Duration in years : 3

   (C)Extension period if any: No

4. Details of Departments Supported

Sl No	Name of Department	Courses (B.Sc./M.Sc./PG Diploma, certificate etc) offered	Regular Faculty members	
			Total =	
			With Ph.D.	Without Ph.D.
1.	Chemistry	B.Sc. (H) Chemistry, B.Sc. Physical Sciences (Chemistry)	Dr. Sanjay Kumar	
			Dr. Vinod Kumar	
			Dr. Ashu Gupta	
			Dr. Reeta Sharma	
			Dr. Arkaja Goswami	
			Dr.Reshu Chaudhary	
			Dr. Ompal Singh Yadav	
2.	Physics	B.Sc. Physical Sciences	Dr. Ravinder Kumar	
			Dr. Monika Gupta	
			Dr. Komilla Suri	
			Dr. Narender Singh	
			Dr. Vijay Kumar Sharma	
			Dr. Seema Dabas	
			Dr. Neeti Agrawal	
			Dr. Arun Goyal	
			Dr. Sunny Aggarwal	
			Dr. Pradeep Kumar	
			Dr. Ravinder Kumar	
			Dr. Narendra Singh	
			Dr. Pooja Devi	
			Dr. Raju Ram Meena	
			Dr. Anita	

5. Number & Date of Advisory committee meeting held :-

6. Qualitative improvements due to DBT support. Please highlight 5 salient points (within 1000 words). (You may enumerate 5 minor projects where students were involved and their impact or similar activities and their outcome; this is for representative purpose and coordinator may include details as per his own choice; kindly refrain from providing philosophical data Avoid any introduction. All the justifications must be very crisp like any aspect non-existent pre-STAR Scheme and you achieved after the grant). This information may be given department wise:-

Under the illustrious DBT Star College Scheme, the college has seen tremendous improvements in terms of strengthening education, training and research at undergraduate level. In the past three years, the college has successfully implemented various objectives of the scheme by:

- **Strengthening academic and physical infrastructure for achieving excellence in teaching and training:** Under the aegis of this scheme, the departments have greatly improved and updated existing library and laboratory resources via procurement of core and new instrumental techniques and curricular books in large numbers.
- **Promoting networking and strengthening ties with other institutions via organization of conferences/seminars/workshops/lectures:** With an aim to bring together teachers, professors, young budding researchers and students on a common platform to share and learn knowledge in current research areas, the departments organized many such activities. To mention some most recent and notable ones, National and International Webinars on 'Sustainable Polymers', 'Water Quality Assessment of Indian Rivers', 'Sustainable Circular Economy: A Solution to Global Issues', 'Entanglement Entropy and Holography' and One-Week National Workshop on 'Emerging Trends in Science and Technology: Issues in this Unprecedented Times' were organized. In addition to this, the college also organized an Outreach Programme on 'Virtual Workshop on Laboratory Set-Up' under the aegis of Vidya Vistar Project and DBT Star College Scheme with Kalahandi University, Odisha.
- **Giving exposure to practical scale up in industries and research laboratories:** The college organized field/industrial visits. Recently, an industrial visit was made to Yakult Danone, Sonipat where a batch of 42 students of BSc (H) Chemistry and BSc Physical Science along with faculty members and lab staff visited the manufacturing plant.
- **Optimizing technical capabilities of faculty and lab staff:** The department conducted lab-skill training programmes. A week-long Inter College 'Hands on Capacity Building Training Workshop for Non-Teaching Staff' was organized. A

total of 30 non-teaching staff members participated from various colleges of Delhi University.

- **Enhancing the quality of thinking, learning and teaching process:** In addition to the existing practicals, students have been given hands-on-exposure to new beyond-the-curricular practicals and project work. This will motivate the students towards pursuing higher studies and building up a career in scientific research and development. On this note, many projects have been supervised by the faculty of Chemistry department. Some of the most notable ones are described briefly below:

  A. Green synthesis of magnetic nanoparticles using potato extract for water remediation such as dye degradation

  Considering the importance of magnetic nanoparticles in various areas of scientific advancement, the students synthesized Fe_3O_4 magnetic nanoparticles using simple iron salt as metal precursor and freshly prepared potato extract as a green reaction medium and as both reducing and stabilizing agent. For the preparation greener method is utilized instead of chemical methods which may be harmful for both humans and our environment. The particles so-synthesized were further used for water remediation application, i.e. in the degradation of Rhodamine B dye using UV-Vis spectrophotometer.

  Outcome: This experiment develops a systems thinking approach. This approach toward chemistry education encourages deep exploration of concepts besides promoting development of higher order thinking skills and execution of own laboratory investigations under novel situations. Students have learnt life cycle analysis of a material; starting from the origin of its feedstock, to its manufacturing process and finally to its use, reuse, and disposal. It also drives an intellectual reasoning toward its impact on society, humankind, economy, and environment during its entire life span. The students also got a hand-on-exposure on basic instrumentation techniques such as UV-Vis spectrophotometer which would otherwise have not been possible in the absence of financial support provided by DBT.

  B. Review article writing on phosphate content in soft drinks and its determination spectrophotometrically

  Students determined the content of phosphate in soft drinks using UV-Vis spectrophotometer. Further, the students learnt the process of article writing according to scientific journal formats.

  Outcome: In this process, the students learnt what scientific journals are, what are the various components of an article, what do we mean by citation, references,

etc. This was an important outcome as publication of a research article plays an important role in the career of a researcher.

C. To investigate the property of corrosion inhibition on Aluminum via Kala Vasa leaf extract in acidic medium environment

In this experiment the students synthesized a green corrosion inhibitor using Kala Vasa leaf extract and utilized it for inhibition of corrosion on Aluminium.

Outcome: In this process, the students learnt that plants contain various phytochemicals which can be used as chemical reagents. Through this project they learnt how to identify a problem and also how to find its solution using green chemistry. This learning plays an important role in research and development.

D. Synthesis and analysis of different coordination complexes of copper using colorimeter:

In this experiment, students performed the preparation of many copper complexes with different ligands available in lab. Various synthesized copper complexes were further studied and compared as per the CFSE theory with the help of colorimeter.

Outcome: The experiment was based on the basic concepts with coordination chemistry and understanding of ligand-metal interaction in terms of crystal field theory. Students not only learnt the synthesis of various copper complexes but also learnt the stability of these complexes in terms of weak and strong field ligands. Students also erudite about working with the colorimeter. After measuring wavelength with each copper complexes, students concluded in terms of the ligands from strongest to weakest field ligand asper the CFSE theory.

E. To study sunlight-driven N-acetylation of aniline via a green chemistry approach:

The present society needs upgradation and improvement with time. In contrast to previous harmful methods, for acetylation of anilines, we need the development of economical, efficient and sustainable approach for acetylation. In this experiment students performed the acetylation of aniline in presence of greener solar radiation in less time.

Outcome: This experiment helps to learnt and understand the principles of green chemistry. In this experiment, cheap and clean nature of solar radiation draws much attention of students to implement principles of green chemistry in a chemical reaction. This helps us to achieve overall development of students. With the positive results in terms of acetylation, students are able to develop intellectual thinking and promoting scientific outlook, which ultimately contribute as constructive feedback to the environment.

7. Any Novel aspect introduced during the Scheme duration.

- Advancement of scientific skills of students such as conceptual knowledge, experimental design, data acquisition, analysis and report writing.
- Expansion of technical skills by gaining hands-on experience.
- Productive exposure to quantitative and qualitative analytical techniques.
- Healthier understanding of green chemistry in action.
- Application of scientific knowledge to sustainable solutions of real problems.
- Hand-on exposure to various analytical instruments purchased under the DBT grant.
- Reinforcement of the concepts which the students were learning online during the pandemic years.

8. Lessons learnt / difficulties faced/suggestions if any, in implementation of the programme and utilization of DBT grant. (Max 3 points within 300 words).

Lessons learnt:

- After the uplifting of COVID-19 restrictions, the described projects were successfully executed in a physical form. This enhanced conceptual knowledge of students and given them exposure to solve real time problems using basic chemistry.
- Even amidst the devastating pandemic, students came forward and used a virtual platform to learn and share knowledge on those objectives which did not get fully successful in the physical manner. This shows an optimistic inclination towards the goal which was supposed to be fulfilled under the DBT Star College Scheme.

Difficulties faced:

- Due to the upsurge in cases of COVID-19 in the entire nation, strict lockdown was imposed in various parts of the country including Delhi. This hampered the successive implementation of the programme. Outstation activities and visits were also hampered. Due to COVID-19 threat, companies and industries were reluctant to welcome the students.

9. <u>Key performance indicators</u>

<table>
<tr><th>S. no</th><th>Indicator</th><th colspan="9">Pre-support</th><th colspan="9">During /After Support</th><th>Remarks</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">No. of students admitted</td><td colspan="9">Total = 673</td><td colspan="9">Total = 935</td><td></td></tr>
<tr><td colspan="5">M= 514</td><td colspan="4">F= 159</td><td colspan="5">M= 711</td><td colspan="4">F= 224</td><td></td></tr>
<tr><td>SC</td><td>ST</td><td>OBC</td><td>G</td><td>SC</td><td>ST</td><td>OBC</td><td>G</td><td>SC</td><td>ST</td><td>OBC</td><td>G</td><td>SC</td><td>ST</td><td>OBC</td><td>G</td><td></td></tr>
<tr><td>73</td><td>03</td><td>185</td><td>249</td><td>22</td><td>0</td><td>23</td><td>99</td><td>119</td><td>12</td><td>225</td><td>355</td><td>35</td><td>2</td><td>59</td><td>128</td><td></td></tr>
<tr><td>2</td><td>Admission cut-off %</td><td colspan="9"></td><td colspan="9">As per CUET result</td><td></td></tr>
<tr><td>3</td><td>No. of students passing out (%) [Students Admitted/passing out (pass %)]</td><td colspan="9">~90 % (For B.Sc. Physical Sciences)
&
~96 % (For B.Sc. (H) Chemistry)
(Same data for Physics Department)</td><td colspan="9">~90 % (For B.Sc. Physical Sciences)
&
~96 % (For B.Sc. (H) Chemistry)
(Same data for Physics Department)</td><td></td></tr>
<tr><td>4</td><td>Drop-out rates</td><td colspan="9">0%</td><td colspan="9">0%</td><td></td></tr>
<tr><td>5</td><td>No. of students opting for MSc / M.Tech/ PG Diploma in Science</td><td colspan="9">Exact data is not available; but
~20-25 % opted for M.Sc.</td><td colspan="9">Exact data is not available; but
~45 % opted for M.Sc.</td><td></td></tr>
<tr><td>6</td><td>Average marks</td><td colspan="9">~80-90 % (For both B.Sc. Physical Sciences & B.Sc. (H) Chemistry)</td><td colspan="9">~80-90 % (For both B.Sc. Physical Sciences & B.Sc. (H) Chemistry)</td><td></td></tr>
<tr><td>7</td><td>No. of hands-on experiments being conducted</td><td colspan="27" rowspan="9">Details for 7-15 points are enclosed in Annexure I</td></tr>
<tr><td>8</td><td>No. of new experiments introduced</td></tr>
<tr><td>9</td><td>Publications (scopus indexed) /patents, if any.</td></tr>
<tr><td>10</td><td>Training received by
(A) Faculty
(B) Students (Summer/ Winter Projects)</td></tr>
<tr><td>11</td><td>Exhibitions/seminars /training courses conducted</td></tr>
<tr><td>12</td><td>Books/journals subscribed from grants</td></tr>
<tr><td>13</td><td>Outreach activities (Popular lectures)</td></tr>
<tr><td>14</td><td>Colleges mentored to apply for DBT Star College grants</td></tr>
<tr><td>15</td><td>Invited lectures</td></tr>
</table>

- Proofs (S.No. 6-14 not more than 5 pages per departments, 1.5 line spacing 11 times roman font size) to be provided dulyattested by Principal and Coordinator.

10. Details of colleges / schools mentored during the Star Scheme Tenure (Name of college / school; class / standard; No. of students benefited; whether any mentored college applied under Star College Scheme, if yes what was the outcome.

For mentoring, Shyam Lal College, University of Delhi and Kalahandi University, Odisha organized an Outreach Programme on **'Virtual Workshop on Laboratory Set-Up'** under the aegis of Vidya Vistar Project and DBT Star College Scheme on **07th December 2021** at 12:30 pm using Zoom as an online platform. The Vidya Vistar Scheme is based on the principle of mutual respect, cooperation and sharing between two Colleges/Departments of both the universities as equal partners. The Vidya Vistar Project is being launched with the purpose of sharing a knowledge and offering a holistic academic approach to the young pupil by fostering innovative thinking and research aptitude through interaction with different universities from varied areas of science and technology. It is believed that such workshops of educators and students among the Kalahandi University and Shyam Lal College would enable them in harnessing their skills and creativity to accelerate the innovation at personal as well as organizational levels. With these objectives in mind, the present workshop was organized which is also the very first event organized under the above-said project. The event was well attended by over 100 participants, including **Prof. Sanjay Satpathy**, Vice Chancellor, Kalahandi University, **Prof. Rabi Narayan Kar**, Principal, Shyam Lal College, **Mr. Haladhar Sahu**, Nodal Officer, Kalahandi University, **Prof. Kusha Tiwari**, Coordinator Vidya Vistar & IQAC along with teachers and students of both the universities from varying backgrounds. Many of the students from Kalahandi University joined the session using a single id and got benefitted by listening to the speakers on a common projector screen. In the program, glimpses of the various courses, activities and projects in which the faculties and the students of Chemistry Department are indulged in, were given. A roadmap was shared which the students can follow after the completion of their graduation courses. A virtual tour of the Chemistry and Physics Laboratory and the Sophisticated Analytical Instrumentation Laboratory where numerous instruments are kept many of which have been purchased using the DBT Grant provided under the Star College Scheme. Working and the possible experiments which the students are performing according to the reported BSc syllabi and also under the DBT Project were also described.

11. Details of increase in the faculty generated resources viz extramural research grants from other funding agencies to strengthen the Star College Scheme efforts.

NIL

12. SOPs developed, lab manuals created and uploaded on website or submitted to DBT.

SOP for Flame Photometer and UV-Vis Spectrophotometer are uploaded on the college website.

13. Self evaluation

Department	*Objective (as stated in proposal)	% achieved	Reasons for underachievement / If achieved, state in quantitative metrics
Chemistry	**FOR STUDENTS** • Exposure to new practicals other than curriculum (Achieved) • To familiarize students with research culture through project work and lab equipments (Achieved) • To organize visits to research labs (Somewhat achieved) • Organization of seminars/ workshops and lectures (Achieved)	~90%	Due to the upsurge in cases of COVID-19 in the entire nation, strict lockdown was imposed in various parts of the country including Delhi. This hampered the successive implementation of the programme. Outstation activities and visits were also hampered. Due to COVID-19 threat, companies and industries were reluctant to welcome the students.
	FOR FACULTY • Organization of seminars (Achieved) • Procurement of new instruments (Achieved) • To provide access to students to research laboratories (Achieved) • Organization of FDP (Not achieved)		
	FOR LABORATORY STAFF • Organization of lab-skill training program (Achieved) • To upgrade existing lab (Achieved) • To upgrade library facility (Achieved)		
Physics			

* For quantitative analysis you may fix five objective (max) each having 2 marks and accordingly calculate the matrix.

Course Coordinator
(With Seal)
Dr. Ashu Gupta
Coordinator
DBT Star College Scheme
Shyam Lal College
(University Delhi)
Delhi-110032

Head of the Institution
(With Seal)
प्रो. रबि नारायण कर/Prof. Rabi Narayan Kar
प्रोफेसर-प्राचार्य/Professor-Principal
श्याम लाल कॉलेज/Shyam Lal College
दिल्ली विश्वविद्यालय/University of Delhi
शाहदरा, दिल्ली-११००३२/Shahdara, Delhi-110032

****

Annexure I

Department of Chemistry

7. No. of hands-on experiments being conducted

&

8. No. of new experiments introduced

S. No.	Project or Experiment	Date	Title
1.	Project	Jan 2021	Synthesis of silver nanoparticles and to evaluate their catalytic activity in the reduction of 4-nitrophenol
2.	Project	Jan 2021	Synthesis of magnetic nanoparticles and to evaluate their catalytic activity in the degradation of Rhodamine B dye
3.	Project	Feb 2022-Apr 2022	To study the absorption of Rhodamine-B dye using montmorillonite K-10 clay
4.	Experiment	2.04. 2022	Electrical conductivity measurement of perchloric acid doped Aniline added with anionic different surfactant
5.	Experiment	29.03.2022 and 31.03.2022	To study the kinetics of interaction of crystal violet with NaOH colorimetrically
6.	Experiment	31.03.2022	Determination of a mixture of Cobalt and Nickel using UV-Vis spectroscopy
7.	Experiment	31.03.2022	Determination of the isoelectric pH of a protein (Casein)
8.	Project	Oct 2021	Flame Photometric Estimation of Sodium and Potassium Ion Present In Water Sample of Yamuna and Ganga
9.	Project	Marc 2022	Green Catalysis
10.	Experiment	10.08.2021	Estimation of calcium in milk
11.	Experiment	30.07.2021	Separation of green leaf pigments from spinach and neem leaves
12.	Experiment	10.08.2021	To synthesis green corrosion inhibitor namely (E) -2-{(5mercapto 1, 3. 4- thiadiazol -2-yl) imino methyl} benzaldehyde its used as corrosion inhibitor in acidic medium by weight loss method and spouting with theoretical method
13.	Experiment	10.08.2021	Microwave assisted organic synthesis
14.	Experiment	10.08.2021	To prepare dibenzalacetone from acetone and benzaldehyde

15.	Experiment	10.08.2021	Synthesis of silver nanoparticles using neem extract and their characterization using UV-Vis spectroscopy
16.	Project	Jan 2023-Mar 2023	To investigate the property of corrosion inhibition on Aluminum via Kala Vasa leaf extract in acidic medium environment
17.	Project	Jan 2023-Mar 2023	To investigate the corrosion inhibition property via plant kala Vasa (Malabar nut) stem extract on mild steel in acidic medium environment
18.	Project	Feb 2023-Mar 2023	To study sunlight-driven N-acetylation of aniline via a green chemistry approach
19.	Project	Sep 2022-Nov 2022	Review article writing on phosphate content in soft drinks and its determination spectrophotometrically
20.	Project	Feb 2023	Extraction of essential oil from turmeric
21.	Project	Jan 2023	Qualitative analysis of sodium (Na) and potassium (K) in the different soil samples
22.	Project	Sep 2022	Synthesis and Analysis of different coordination complexes of copper using colorimeter
23.	Project	Sep 2022	Isolation of Piperine from Black Pepper
24.	Experiment	Sep 2022	Estimation of total alkalinity in the given solution
25.	Experiment	Jan 2023	To estimate the amount of reducing sugar present in the given sample by using DNSA (3, 5-Dinitro salicylic acid) method
26.	Experiment	06.02.2023	To conduct the isomerization of dimethyl maleate to dimethyl fumerate using green method
27.	Experiment	06.02.2023	To carry out aldol condensation under green conditions and to study the effect of various surfactants as phase transfer catalysts

9. Publications (scopus indexed) /patents, if any.

1. Review article: Heterogeneous catalysis under continuous flow conditions – under revision in *Current Organic Chemistry*

2. Research article: Sunlight-driven N-acetylation of aniline: a green chemistry approach – under revision in *New Journal of Chemistry*

3. Research article: Synthesis of Green Inhibitor for Mild Steel Corrosion in a Sulphuric Acid Medium – accepted in *Portugaliae Electrochimica Acta*

4. Green Nanotechnology: Path for Clean and Safer Molecular Manufacturing – *Journal of Nanoscience, Nanoengineering and Applications*, 10.37591/JoNSNEA

10. Training received by (A) Faculty (B) Students (Summer/ Winter Projects)

(A) Nil

(B) Semiconductors, Nanostructures and Nanomaterials Short Term Course by two students namely Ms. Sweta Mehra and Ms. Anchal Gupta

11. Exhibitions/seminars/training courses conducted

S.No.	Date	Lecture Title	Resource Person/s or Details of the Event	Number of participants
1.	19.11.2020	National Webinar on Sustainable Polymers	Dr. Bimlesh Lochab, Associate Professor, Department of Chemistry (SoNS), Shiv Nadar University	> 50
2.	04.08.2020 to 08.08.2020	One week National Workshop on Emerging Trends in Science and Technology: Issues in these Unprecedented Times	Prof. Gurmeet Singh, VC, Pondicherry University, Prof. Manoj Kumar Dhar, VC, University of Jammu, Dr. Nisha Mendiratta (Advisor/Scientist G & Associate Head, SPLICE DST, GoI), Prof. Debasis Dash (Chief Scientist, CSIR-IGIB), Dr. Charru Malhotra (Coordinator, centre of e-Governance, IIPA), Dr. Anil Kumar, BITS PILANI, Dr. Rahul Johari, GGSIP University	> 200
3.	22.02.2021 to 26.02.2021	Five days-long Hands on Scientific Software Training Programme	Hands on training on scientific softwares such as ChemDraw, Mathematica, HyperChem and Origin.	30
4.	02.03.2021 to 08.03.2021	A week-long Inter College Hands on Capacity Building Training Workshop for Non-Teaching Staff	Hands on training on the preparation of standard solutions, calibration of scientific instruments, sessions on IT skills such as MS Office and purchasing through online platform, GeM.	30

5.	20.09.2021 to 24.09.2021	30 hour long Inter College Training on Preparation & Application of Magnetic Nanoparticles and Hands-on Software Training	Hands-on training on the preparation of magnetic nanoparticles using potato extract and their application in the degradation of dye which was studied using UV-Vis Spectrophotometer. Also, hands-on training on scientific softwares including ChemDraw, Mathematica, Latex and Origin was given.	31
6.	06.02.2023	Lecture and Workshop on Green Chemistry: An essential building block for sustainable development	Hands-on-experience on extracurricular experiments based on green chemistry	> 100

12. List of books procured under DBT grant

1) Inorganic Chemistry: Principles of Structure and Reactivity by Huheey, Keiter and Keiter **2)** Inorganic Chemistry by Shriver and Atkins **3)** Concise Inorganic Chemistry by J. D. Lee **4)** Vogel's Qualitative Inorganic Analysis by Vogel and Svehl **5)** Vogel's Textbook of Quantitative Chemical Analysis by Vogel and Mendham **6)** Inorganic Chemistry by Miessler and Tarr **7)** College Practical Chemistry by Ahluwalia and Dhingra **8)** Solid State Chemistry and its Applications by A R West **9)** A Guidebook to Mechanisms in Organic Chemistry by Peter Sykes **10)** Organic Chemistry by Clayden, Greeves and Warren **11)** Organic Chemistry by Morrison and Boyd **12)** Organic Chemistry by Bruice **13)** Introduction to spectroscopy by Pavia, Lampman and Kriz **14)** Organic Chemistry by Solomons **15)** Spectrometric identification of organic compounds by Silverstein **16)** Physical Chemistry by Atkins **17)** Physical Chemistry by K L Kapoor (Volumes 1-5) **18)** Quantum Chemistry by Levine **19)** Senior Practical Physical Chemistry by B D Khosla **20)** Fundamentals of Analytical Chemistry by Crouch, Skoog, Holler and West **21)** Instrumental Methods of Analysis by Willard, Merritt Jr, Dean and Settoe Jr **22)** Analytical Chemistry by Christian, Schug and Dasgupta **23)** Biochemistry by Stryer **24)** Biochemistry by Lehninger **25)** Biochemistry by Voet and Voet **26)** Green Chemistry: An Introductory Text by Lancaster **27)** Green Chemistry: Theory and Practice by Anastas and Warner **28)** Green Chemistry Experiments: A Monograph by Sharma, Sidhwani and Chaudhari **29)** Introduction to Green Chemistry by Sidhwani and Sharma **30)** Green Chemistry for Beginners by Sharma and Srivastava **31)** Practical Organic Chemistry: Mann & Saunders **32)** Vogel's Textbook of Practical Organic Chemistry **33)** B K Sharma- Industrial Chemistry-I **34)** B K Sharma- Industrial Chemistry-II

35) Mendham- Vogel's Textbook of Quantitative Chemical Analysis **36)** Inorganic Chemistry by Housecroft **37)** Organic Chemistry Lab Manual by Pavia

13. Outreach activities

S.No.	Date	Name of the Industry	Participants
1.	01.09.2022	Yakult Danone, Sonipat 	A batch of 42 students of BSc (H) Chem and BSc Phy Sci along with the faculty members and lab staff

14. Colleges mentored to apply for DBT Star College grants

S.No.	Date	Details of the College	Participants
1.	07.12.2021	Virtual Workshop on Laboratory Set-Up' under the aegis of Vidya Vistar Project and DBT Star College Scheme with Kalahandi University, Odisha	> 100

15. Invited lectures

S.No.	Date	Lecture Title	Resource Person	Number of participants
1.	23.07.2021 	International Lecture on Sustainable Circular Economy-A Solution to Global Issues	Dr. Ashish Pandey, Principal Chemist, CalAgua Innovations Corporation at University of Calgary, Canada	> 150
2.	24.02.2022 	National Lecture on Water Quality Assessment of Indian Rivers	Dr. Sakshi Sharma, Senior Research Associate, Central Water Commission, Department of Water Resources, River Development & Ganga Rejuvenation, Ministry of Jal Shakti	> 50

PHYSICS DEPARTMENT

6. Qualitative improvements due to DBT support. Please highlight 5 salient points (within 1000 words

Response to Point no 6

1. **Strengthening of Existing Labs**: The major impact of the financial support provided by DBT is the significant upgradation of the existing laboratories. The funds received by DBT enabled the Physics department to purchase a large no of instruments starting from basic equipment's like multimeters to DSO, CRO and LCR meters. With the introduction of these new instruments are student to instrument ratio decreased from 6 (Earlier in the absence of DBT grant) to 3-4 through the upgradation of the existing labs (with DBT Grant). A tabular list of certain new instruments are,

	Equipment	Pre DBT Support	With DBT Support
1.	Digital Storage Oscilloscope	1	4
2.	Hall Effect Set Up	2	4
3.	Four Probe Assembly for band gap measurement	2	5
4.	Fluke multimeters	3	7
5.	Autoclave Reactor	0	1
6.	Microcontroller 8051	0	3
7.	Spectrometer	3	8
8.	CRO	4	6
9.	Digital LCR Meter	0	1
10.	Counters	0	3
11.	Digital Function Generator	2	6

In addition to the above-mentioned instruments, certain new experimental set up have also been procured which the department could not run earlier due to unavailability of equipents/funds,

	Equipment	Pre DBT	With DBT Support

		Support	
1.	Fresnal Biprism Experiment Assembly	00	01
2.	Callender and Griffith Bridge PRT	00	02
3.	Planck's Constant using Photocell	00	01
4.	Millikan Oil drop experiment	00	01
5.	Michelson Interferometer	00	01

To name a few, software and related books for library has also been purchased through the DBT grant.

	Software/Books	Pre DBT Support	With DBT Support
1.	MATLAB	00	03
2.	Engineering Optics with MATLAB by Ting-Chung Poon And Taegeun Kim, II Edition, AP publishers	00	01
3.	Essential MATLAB for Engineers and Scientist by Brian D. Hahn And Daniel T. Valentine, VII Edition CRC Press	00	01
4.	Numerical Method for Engineers and scientists using MATLAB by Ramin S. Esfandiari, II Edition CRC Press	00	01
5.	Physical Optics: Principles and Practices Abdul Al. Azzawi, Special Edition for INDIA, CRC Press	00	01

2. **Minor Projects/New Experiments:** The received DBT Star College Scheme motivated the faculty members of the Physics department to undertake and successfully complete minor projects/New Experiments with the students.

(a) **Title :** To compute the Bending loss in optical fiber

Mentorship: Dr. Narendra Singh Chaudhary and Dr. Monika Goyal

Students Team: Hariom, Sarfaraz, Suyash Shukla, Aniket, Ronak Raghuvanshi and Ritik

1. **Learning Outcomes:** The Students gained the basic conceptual understanding of the working of optical fiber and the transmission of light through the optical fibers.
2. The Students gained a deep understanding of various kinds of losses in transmission of signal through the optical fibers and qualitative way of calculating the losses.
3. The students gained practical knowledge of assembling the optical instruments on the optical bench.
4. The students learned to work as an individual or in a team for the development of minor optical projects.

(b) **Title :** Synthesis of SnSe nanoparticles for Thermoelectric applications

Mentorship: Dr. Pradeep Kumar Sharma

Students Team: Ayushi Sharma, Aanchal, Anshum, Piyush, Shivam and Yogita

Learning Outcomes

1. The students were given a brief exposure to Thermoelectricity and potential applications.
2. The students learned the basics of nanoparticles synthesis using bottom-up (Hydrothermal) synthesis route.
3. The students learn to operate hydrothermal autoclave and PID controlled oven.
4. The students were given a brief exposure about powder XRD diffraction experiments.
5. The students learned to analyze XRD data. (calculation of particle size and lattice parameters)

3. Community Outreach Activities: The Grant received from DBT has also been utilized in various outreach programs. To name a few,

1. Educational outreach program to Birla Institute of Technology, Masera Campus, Jaipur on 25-26 August 2022.

   Aim: To familiarize the B.Sc. (Physical Science) students with the current technological advancements in the field of Plasma.
2. An Interactive workshop titled (Gaming with Physics) for the Intermediate School students.

Aim: To boost the interest of the young minds in the fundamental Physics and gives them a rich learning experience by observing, performing experiments and faculty interaction.

3. **'Virtual Workshop on Laboratory Set-Up'** under the aegis of Vidya Vistar Project

   Aim: To share knowledge and offer a holistic academic approach to the young pupil by fostering innovative thinking and research aptitude through interaction with different universities from varied areas of science and technology.

4. **FDP, Workshop, Motivational Sessions:** The DBT grant has also been utilized in organizing national workshop, motivational sessions, and invited lectures. To name a few,

   1. National Workshop titled "Emerging Trends in Science and Technology: Issues in these Unprecedented Times.

   Aim: To give the glimpses of some concepts in Information technology and climate change science to students and faculty to understand Physics

   2. A motivational session on National Innovation and Start-up Policy

   Aim: Emphasizing on Innovation & Entrepreneurship in Higher Education Institutions

5. **Invited Lectures:** An invited Lecture on **'Entanglement Entropy and Holography'** was organized by Shyam Lal College, University of Delhi under the aegis of DBT Star College Scheme in collaboration on **08th September 2021** under **SLC Eminent Lecture Series 2021-2022. Prof. Justin David**, Centre for High Energy Physics, Indian Institute of Science, Bangalore, was the keynote speaker of the day.

(7) **Any Novel aspect introduced during the Scheme duration**

1. Hands on experience was given to students through new experiments (Callender and Griffith PRT, Fresnel Biprism *etc*.) and minor projects (RTD, Synthesis of SnSe Nanoparticles, Supercapacitor *etc*.)
2. A brief research exposure was given to students in minor projects (Synthesis of SnSe Nanoparticles, Synthesis of materials for Supercapacitor applications, Atomic structure calculation of He-like ions *etc*.)
3. Hands on training in the software MATLAB.
4. Hands on training on various instruments (DSO, CRO, Function Generators *etc.*)

8. Lessons learnt / difficulties faced/suggestions if any, in implementation of the programme andutilization of DBT grant. (Max 3 points within 300 words).

1. The outreach activities have been significantly hampered throughout the covid19 period and leads to less industry/research outreach Programmes.
2. The students should be motivated to take active participation in the conferences/seminars/workshop organized by other departments/colleges.

9. **Key performance indicators**

S. no	Indicator	Pre-support	During /After Support	Remarks
1	No. of students admitted	**Total =**	**Total**	
		M= **F=**	**M=** **F=**	
		SC ST OBC G SC ST OBC G	**SC ST OBC G SC ST OBC**	
		)		
2	Admission cut-off %			
3	No. of students passing out (%) [Students Admitted/passing out (pass %)]			
4	Drop-out rates			
5	No. of students opting for MSc / M.Tech/ PG Diploma in Science			
6	Average marks			
7	No. of hands-on experiments being conducted	00	10	1)PRT 2)Maxwell Bridge 3)Fresnel BiPrism 4)Polarimeter 5)Supercapacitor 6) Syntheis of NP 7) MV using IC555 8)Atomic data 9) Photocell 10)Bending Losses
8	No. of new experiments introduced	00	5	1) PRT 2) Fresnel Biprism 3) Photocell 4) Michelson Interferometer 5) Milikan's Oil Drop
9	Publications (scopus indexed) /patents, if any.			
10	Training received by (A) Faculty (B) Students			
11	Exhibitions/Seminars /training courses conducted		03	1) School Students 2) National Workshop 3) IIC training session
12	Books/journals subscribed from grants		04	1) MATLAB and Optics
13	Outreach activities (Popular lectures)		02	1) Educational Tip 2) Virtual workshop
14	Colleges mentored to apply for DBT Star College grants		00	

15	Invited lectures		01	1)Lecture by Prof. Justin David

10. Details of colleges / schools mentored during the Star Scheme Tenure (Name of college / school; class / standard; No. of students benefited; whether any mentored college applied under Star College Scheme, if yes what was the outcome.
11. Details of increase in the faculty generated resources viz extramural research grants from other funding agencies to strengthen the Star College Scheme efforts.
12. SOPs developed, lab manuals created and uploaded on website or submitted to DBT.

11. Self evaluation

Department	***Objective (as stated in proposal)**	**% achieved**	**Reasons for underachievement / If achieved, state in quantitative metrics**
Physics	Expose to new practical other than curriculum	90	
	To familiarize students with research culture through project work and summer training.	80	
	To organize visits to research laboratories and industries for better understanding of technology and industry requirements.	50	
	To organize multidisciplinary Seminars/Workshops/Conferences for interaction with eminent scientists and industrialists for motivating students to pursue higher and specialized studies in science	80	
	To invite eminent speakers from renowned institutes for lectures	50	
	to increase capabilities of core instrumentation resources by procuring new equipment and upgrading of existing facilities	100	
	To upgrade existing laboratory and library facilities by procuring new equipments and books respectively.	80	

* For quantitative analysis you may fix five objective (max) each having 2 marks and accordingly calculate the matrix.

(Proof for serial no. 7 and 8)

1. **Title of Project:** Synthesis of SnSe nanoparticles for Thermoelectric applications

   Mentorship: Dr. Pradeep Kumar Sharma

   Students Team:

S.No	Name	Course and Year
1	Ayushi Sharma	B.Sc. Physical Science II Year
2	Aanchal	B.Sc. Physical Science III Year
3	Anshum	B.Sc. Physical Science III Year
4	Piyush	B.Sc. Physical Science III Year
5	Shivam	B.Sc. Physical Science III Year
6	Yogita	B.Sc. Physical Science III Year

2. **Title of Project :** Study of RTD trainer kit

   Mentorship: Dr. Pradeep Kumar Sharma

   Students Team:

S.No	Name	Course and Year
1	Anjali Chand	B.Sc. Physical Science III Year
2	Aanchal	B.Sc. Physical Science III Year
3	Roshan	B.Sc. Physical Science II Year
4	Ritvij	B.Sc. Physical Science II Year
5	Avinash	B.Sc. Physical Science II Year

3. **Title of Experiment** : CALLENDER & GRIFFITS BRIDGE PLATINUM RESISTANCE THERMOMETER

   Mentorship: Dr. Pradeep Kumar Sharma and Dr. Monika Goyal

   Student Team:

S.No	Name	Course and Year
1	Kashish	B.Sc. Physical Science I Year
2	Anshu	B.Sc. Physical Science I Year
3	Tarun Panwar	B.Sc. Physical Science II Year
4	Harsh Kansal	B.Sc. Physical Science II Year

4. **Title of Experiment :** Measurement of Inductance By Maxwell's Bridge

Mentorship: Dr. Pradeep Kumar Sharma and Mr. Raju Ram Meena

Student Team:

S.No	Name	Course and Year
1	Aastha	B.Sc. Physical Science II Year
2	Muskan	B.Sc. Physical Science II Year
3	Saloni	B.Sc. Physical Science II Year
4	Anamika	B.Sc. Physical Science II Year
5	Nitika	B.Sc. Physical Science II Year
6	Riya Prajapati	B.Sc. Physical Science II Year
7	Khushi	B.Sc. Physical Science II Year

5. **Title of Experiment :** To determine the specific rotation of a cane sugar solution (Polarimeter)

Mentorship: Mr. Raju Ram Meena, Mr. Ravinder Kumar and Dr. Pradeep Kr Sharma

Students Team:

S.No	Name	Course and Year
1	Deepak Kumar	B.Sc. Physical Science (Chemistry) II Year
2	Anuj	B.Sc. Physical Science (Chemistry) II Year
3	Muskan	B.Sc. Physical Science (Chemistry) II Year
4	Burhan Riyaz	B.Sc. Physical Science (Chemistry) II Year

6. **Title of Project:** To Determine the value of Plank's Constant using photodiode

Mentorship: Dr. Narendra Singh and Dr. Monika Goyal

Student Team:

S.No	Name	Course and Year
1	Hardik	B.Sc. Physical Science (Electronics) III year
2	Mansi Singh	B.Sc. Physical Science (Electronics) III year
3	HarshChandan	B.Sc. Physical Science (Electronics) III year

7. **Title of Project:** To Determine wavelength of monochromatic light using Fresnel Biprism
Mentorship: Dr. Narendra Singh and Dr. Seema Dabas

Student Team:

S.No	Name	Course and Year
1	Hariom	B.Sc. Physical Science I Year
2	Sarfaraz Ali	B.Sc. Physical Science I Year
3	Suyash Shukla	B.Sc. Physical Science I Year
4	Prachi Singh	B.Sc. Physical Science I Year
5	Vansh Kochhar	B.Sc. Physical Science I Year
6	Aviral Singh	B.Sc. Physical Science I Year
7	Prachi Chaturvedi	B.Sc. Physical Science I Year

8. **Title of Project:** Atomic structure calculation of He-like ions

Mentorship: Dr. Sunny Aggarwal and Dr. Arun Goyal

Students Team:

S.No	Name	Course and Year
1	Kanika Sharma	B.Sc. Physical Science (Chemistry) I Year
2	Anupama Saini	B.Sc. Physical Science (Chemistry) I Year
3	Charu Pandey	B.Sc. Physical Science (Chemistry) I Year
4	Akansha pal	B.Sc. Physical Science (Chemistry) I Year
5	Renu Sharma	B.Sc. Physical Science (Chemistry) I Year

9. **Title of Project:** To design an multivibrator using IC 555 and study their waveforms on DSO

Mentorship: Mr. Ravinder Kumar, Mr. Raju Ram Meena and Dr. Monika Goyal

Students Team:

S.No	Name	Course and Year
1	Niharika Singh	B.Sc. Physical Science III Year
2	Gautam Porwal	B.Sc. Physical Science III Year
3	Mansi Singh	B.Sc. Physical Science III Year
4	Gaurav Agarwal	B.Sc. Physical Science III Year
5	Ajay Shiwal	B.Sc. Physical Science III Year
6	Harsh Chauhan	B.Sc. Physical Science III Year
7	Sapna pathak	B.Sc. Physical Science III Year

10. **Title of Project:** Synthesis and Electrochemical properties of Nickel-Cobalt-Sulphur for Electrochemical Applications

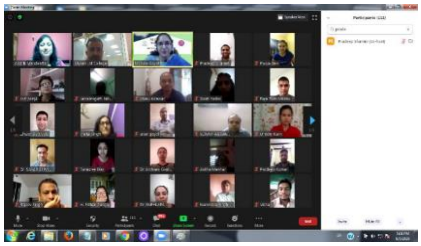
    Mentorship: Ms. Pooja Devi

    Students Team:

S.No	Name	Course and Year
1	Shainty Kumar	B.Sc. Physical Science I Year
2	Anshum kumar	B.Sc. Physical Science I Year
3	Harsh	B.Sc. Physical Science I Year
4	Sarfaraz Ali	B.Sc. Physical Science I Year
5	Lovey	B.Sc. Physical Science I Year
6	Nidhi Malik	B.Sc. Physical Science I Year
7	Shivam Kumar	B.Sc. Physical Science I Year

(Proof for serial no. 11 Workshop/seminar/Training Session)

1. **Title of Workshop: Emerging Trends in Science and Technology: Issues in these Unprecedented Times**



Dates: 4-8 Aug 2020

Participants: 200 Faculty and Students

Brief Description:

A week-long National Workshop on the topic "Emerging Trends in Science and Technology: Issues in these Unprecedented Times" was organized by SLC, under the aegis of DBT star college scheme and in collaboration with IQAC, SLC. This workshop was very successfully organized virtually on zoom platform under the able leadership of our Principal, Prof. Rabi Narayan Kar. The inaugural ceremony on 4th Aug, 2020 saw the benign presence of Prof. Gurmeet Singh, honorable Vice Chancellor, Pondicherry University. A few prominent speakers included Dr. Nisha Mendiratta (Advisor/Scientist G & Associate Head, SPLICE DST, GoI), Prof. Debasis Dash (Chief Scientist, CSIR-IGIB), Dr. Charru Malhotra (Coordinator, Centre of E-Governance, IIPA) and others. The valedictory function on 8 Aug, 2020, saw the kind presence of Prof. Manoj Kumar Dhar, honorable Vice Chancellor, University of Jammu, who blessed us with his encouraging words.

2. **Title of Workshop: Gaming with Physics**

Dates: 4-6 Aug 2022

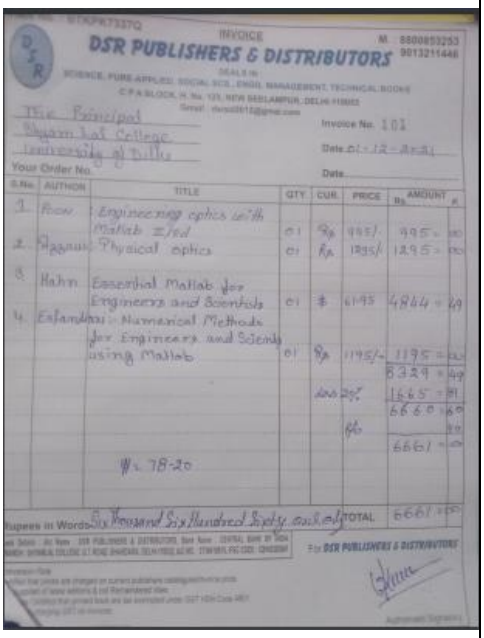
Participants: 50 Students and Faculty members

Brief Description:

A three days-long interactive workshop for Intermediate school students "Gaming with Physics" was organized by the Department of Physics, under the convenorship of Ms. Niti Agrawal, Teacher-In-Charge, during 4th – 6th August 2022 under the aegis of DBT Star College Scheme. Twenty-five (25) students studying in class XIIth of K.L.K Saraswati Bal Mandir, Mehrauli along with their P.G.T Physics, Mr. Prabhakar Mishra, participated in this workshop.

The aim of the workshop was to boost the interest of the young minds in the fundamental of physics and gives them a rich learning experience by observing, performing experiments and faculty interaction. The participants were given hands on training on different instruments.

Proof for Serial No 12

	Software/Books	
1.	MATLAB	
2.	Engineering Optics with MATLAB by Ting-Chung Poon And Taegeun Kim, II Edition, AP publishers	
3.	Essential MATLAB for Engineers and Scientist by Brian D. Hahn And Daniel T. Valentine, VII Edition CRC Press	
4.	Numerical Method for Engineers and scientists using MATLAB by Ramin S. Esfandiari, II Edition CRC Press	
5.	Physical Optics: Principles and Practices Abdul Al. Azzawi, Special Edition for INDIA, CRC Press	

Proof for Serial No 13

1. Virtual Workshop (Kalahandi Uni)

This is hereby reported that Shyam Lal College, University of Delhi and Kalahandi University, Odisha organized an Outreach Programme on 'Virtual Workshop on Laboratory Set-Up' under the aegis of Vidya Vistar Project and DBT Star College Scheme on 07 th December 2021 at 12:30 pm using Zoom as an online platform (Annexure 1). The Vidya Vistar Scheme is based on the principle of mutual respect, cooperation and sharing between two Colleges/Departments of both the universities as equal partners.

The event was well attended by over 100 participants, including Prof. Sanjay Satpathy, Vice Chancellor, Kalahandi University, Prof. Rabi Narayan Kar, Principal, Shyam Lal College, Mr. Haladhar Sahu, Nodal Officer, Kalahandi University, Prof. Kusha Tiwari, Coordinator Vidya Vistar & IQAC along with teachers and students of both the universities from varying backgrounds.

2. Educational Trip to BIT Jaipur

Department of Physics, Shyam Lal College organized an educational outreach program to Birla Institute of Technology, Masera Campus, Jaipur on 25-26 August 2022. The trip was organized under the mentorship of Dr. Sunny Aggarwal and Dr. Pradeep kumar Sharma.

In the outreach program 11 students and 3 faculty members visited the BIT campus Jaipur and attended a detailed informative lecture about the basic understanding and potential applications of Plasma followed by an exhibition. In the exhibition the students were given demonstration of various set up generating plasma and the glimpses of emerging applications. The main theme of the educational outreach program was to expose the UG students towards the fundamental sciences. This trip not only helped them in learning new facts but also boosted their enthusiasm towards science.