

Tender for providing services of “Labs on Wheels”



**UTTARAKHAND STATE COUNCIL FOR SCIENCE AND
TECHNOLOGY**

Vigyan Dham, Chakrata Road, Jhajra, Dehradun-248015(Uttarakhand)

IMPORTANT DATES

Bid Documents Download Start Date	22 nd Nov, 2023 at 16:00 hours
Last Date of Submission of Technical and Financial bid along with Tender Fee & EMD	13 th Dec, 2023 at 16:00 hours
Date of Opening of Technical Bid	14 th Dec at 11:30 hours
Date of Presentation & Display of Itmes Resource and Innovation Kits	18 th Dec at 11:30 hours
Opening of Financial Bid	Will be communicated after the Technical Evaluation
Tender Fee	Rs. 10,000/-
EMD Amount	@2% of Total Quoted Project Cost

Bidder shall submit their bids in separat sealed Envelope (Physical Form) in 3(THREE) parts 'PART-I Pre Bid Criteria (Tender Fee and EMD- in favor of "Uttarakhand State Council for Science & Technology" payable at Dehradun)' along with self declaration certificate that the firm has not been blacklisted in the past by the central govt. departments/State Govt. Departments/PSUs of Central/State Govt. PART-II (Technical Bid with necessary documents)' and 'PART-III (Financial Bid)' before the last date 13th Dec, 2023 at 16:00 Hour along with Tender Fee & EMD clearly superscript with the Part I, Part II & Part III enclosed in Single sealed envelope by Registered/Speed Post.

The
Director General,
UCOST , Vigyan Dham, Jhajra
Chakrata Road, Dehradun-248015
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Tender for 'Lab on Wheels' Programme

Genesis:

Many schools lack the infrastructure, tools or resources to create an interactive and sustainable approach to experiential learning as envisaged in the NEP. Didactic and uninspiring education methods still practiced by schools fail to provide disadvantaged children the tools to overcome constraints. While India's 'Demographic dividend' is seen as its comparative advantage across the world, it has not succeeded much in reforming its heavily regulated education system to equip its youngsters.

With the Right to Education Act, 2008, that makes free and compulsory education for children between 6 and 14 years a fundamental right, enrolment rates have increased significantly (96% of all children in India enroll in schools) in the last decade. However, enrolment alone is not a right measure, especially when we consider quality and how many Indian children are unable to attend school due to their socio-economic constraints.

Cognitive scientists have shown that the human brain can retain in its long-term memory 95% of what we teach. Any attempt that makes use of this critical insight when developing our experiential learning programs that focus on learning through participation, peer-to-peer teaching and hands-on activities will have positive impact. This approach has demonstrated an increased level of motivation and participation, better concept retention and strengthened leadership among children. Using experiential and hands-on, child-centric approach, teacher education and scalable methods are crucial for effective education, Therefore any initiative that aims to bring about a shift in five vital mentioned behaviors (below) through highly innovative and effective outreach channels is of paramount importance. Answers to- 'Yes, to Why,' 'Looking to Observing,' 'Passiveness to Exploring,' 'Text-book to Hands-on,' 'Fear to Confidence' are key to success of any educational intervention.

Eighth All India School Education Survey Conducted by NCERT in 2009 shows that status of laboratory facilities in India is not adequate. In secondary schools in the country, only 42.03% Schools are having facility of science laboratories and among these, 70.64% schools are having adequate science lab facilities. In higher secondary schools, at secondary stage only 59.67% are having Science laboratory and out of these schools, only 57.14% are having adequate facility.

The NEP has strongly emphasized experiential learning. Therefore, to sync educational practices with NEP and to address the problem of STEM education in the state, suitable interventions are necessary with urgency. While it will be a daunting task to establish such a large number of laboratory facilities in schools, the gap of science laboratories and to complement science education in schools of rural and hilly areas of the state with hands-on and experiential learning resources, 'LAB ON WHEELS' programme in the state may be a an inexpensive and quick solution and right step to urgently address the issue.

Objective of 'Lab on Wheel' Programme

1. To act as mobile laboratory for under resourced government schools to complement science and maths education through hands-on experiments and activities in STEM (Science, Technology, Engineering and Maths) education and facilitate discovery approach in learning of science.
2. To spark curiosity, nurture creativity, innovative spirit and instill confidence in students of under resourced government schools of Uttarakhand spread over 13 districts.
3. To develop experiential skills and encourage meaningful learning.
4. Empowering government school educators/teachers to design creative ways to teach science in classrooms.
5. To undertake professional development of science and maths teachers.
6. To inspire innovation.

The Requirement

1. Providing Services of 13 Units in Phases for The 'Lab on Wheels':

In order to undertake science popularisation and science communication activities in rural areas, supplement school science and mathematics education, develop curiosity, interest & motivation of students to learn science and develop interest in science and maths, create experiential learning ecosystem in schools, undertake professional development of science and maths teachers and to meet the objectives of the programme, services of 13 mobile science laboratories in

mini van for the “**Lab on Wheels**” programme are required to be implemented in phases. These buses will popularize science, take science to nook and corner of the state and facilitate the learning of curriculum-based concepts in biology, chemistry, physics, mathematics etc. through lab experiments, hands-on exhibits/models, activities & demonstrations.

Besides Lab on Wheel buses, their operation and optimum utilization will also be an integral part of the services provided. Therefore, the agency will be required to:

1. Procure vans as per requirement, body modification as per requirement of the labs and operation of 13 Labs on Wheel, one in each district, round the year.
2. Recruitment of trained Supervisor, Instructors/mentors and Driver for each ‘Lab on Wheel’ van.
3. Coordination with education department to finalize the plan for the execution of visit roster in schools.
4. Arranging all essential resource material and accessories for the programme as per requirement in sync with NCERT/state curriculum of 6 to 10 standards in STEM.
5. Periodic evaluation/assessment of the programme and submitting reports
6. Organising all activities, events, fairs and festivals as per the list below:
 - a. Hands on experiments based on curriculum for 6-10 standards
 - b. Organizing entertaining science shows to arouse curiosity of students
 - c. Science film shows
 - d. Live sky observation sessions with telescope
 - e. Science fairs with participatory workshops
 - f. Innovation festivals
 - g. Teacher training/workshops for their professional development

The Infrastructure:

A. The Bus/Van:

1. Buses/Vans (BS-6) (Tempo Traveller 3050 delivery van. with 9.3 ft. Loading space **OR** Ashok Leyland Bada dost i-4 model with 9.8 ft. Loading space (The van’s body to be converted/modified as per lab requirement), including registration, Life-time tax, permits, GPS, Speed governor, Painting and branding artwork on the bus as per UCOST specifications.

2. Annual refurbishing, brand stickering, painting, spare parts, tools, periodic recommended servicing and day to day maintenance
3. Fuel for running the bus

B. Kits : Each van will consist of science and maths kits (Suggestive list given in **Annexure-III**) to explain concepts in science suitable for class 6-10 as per NCERT syllabus in enjoyable way,

C. Experiments: experimental resources and setup in each van to conduct experiments in classroom based on concepts of science included in the curriculum of class 6 to 10 as per NCERT syllabus. (Suggestive list of material – **Annexure-III**)

D. Exhibits: Table-Top interactive/working Exhibits/models for each van explaining principles of science and mathematics through fun and excitement
(minimum list in **Annexure-III**).

Add-on Resources: Telescope (Celestron Power Seeker), Lap top (Intel Core i5 processor (HP/Dell), LED/TFT screen 55 Inch for film screening and science videos on various topics of science, mathematics and technology for each van.

Expected Outcome:

1. Better learning of science concepts
2. Exposure of students to concepts in their curricula with hands-on approach resulting in better understanding and development of motor and experimental skills
3. Enhanced appreciation and understanding of science through exposure of fun side of experiential learning.
4. Students will acquire questioning attitudes, problem solving skills and scientific temper.
5. Students will be better aware of STEM issues for taking-up the challenges of 21st century and be inspired to take S&T as career option.
6. Students will be inspired and develop entrepreneurial and innovative spirit
7. Science and mathematics teachers will become professional in their approach and improve classroom teaching approach by providing experiential learning environment

The Content and Operation:

Topics to be covered (Minimum but not limited to):

Digestive System, Force, Chemical and Physical change, Cell and Microscope, Human Torso, Acid, Base and Salt, Skeleton System, Separation Techniques, Light, Electricity, Magnetism, Friction, Sense Organs, Ecosystem, Body Movements, Heat and Temperature, Biodiversity, Respiration, Nervous System, State of Matter, Metal and Non-Metal, Sound, Pressure, Life Cycle of Animals, Water/Pressure and Density, Micro-organisms, Astronomy, Work and Energy, Circulatory System, Force and Motion, Chemistry in Daily Life, Anatomy, Changes Around Us, Metamorphosis, Photosynthesis, States of Matter, Environment, Ecology and Area, volume, quadratic equation, simple and compound interest, sets, binary numbers, many more as per state curriculum for standards 6 to 10.

Mobile Science Lab: Each van well-fitted with lab equipment, models and outreach resource material that will travel with a driver and two instructors to government run schools in each district. The instructors to build on children's innate curiosity through simple experiments, models made from easily available, reusable material. This outreach program will also have the capacity to conduct:

Science Fairs: Science Fairs and summer camps will be organised by each unit to build models and demonstrate science concepts to the children. The science experiments will provide the children with the opportunity to learn about various topics through a fun, hands-on and lasting experience. Hands-on workshops on interesting themes will also be organized to develop interest of students. Some Young enthusiastic students are to be identified as volunteers during these fairs and these are instrumental for deliver peer-to-peer learning during subsequent fairs. Various competitions, problem solving exercises, lectures by scientists/technocrats and question answer sessions will also be organized for students.

Volunteer Training: encouraging peer to peer teaching to give children the confidence to communicate their ideas, explain concepts and better understand themselves through teaching their peers should be encouraged. These volunteers are to be trained to demonstrate the science models and other science concepts to their peers. While this boosts confidence and improves communication skills of the volunteer students, it also leads to greater interaction and comprehension of concepts for the peers.

Teacher Training Workshops: Teachers are to be trained to enable them to disseminate knowledge, propagate creative-thinking and develop problem-solving skills among the children using hands-on approach to provide experiential learning. This will significantly improve the classroom learning environment and provide a more productive student-teacher interaction, leading to an improved learning ability for each child.

Sky Observation Programme: Each van is to be equipped with a good telescope for night sky observation for interested students. The sky observation sessions should precede with introductory slide show based lecture on important astronomy concepts to arouse interest of students. Volunteers may also be trained in conducting sky observation sessions and observing sky with naked eye.

Eligibility Criteria:-

- 1. The agency must have at least 5 years of experience in providing such mobile science lab services in at least 2 states of India.**
- 2. The agency should have provided or run the programme with at least 10 vans in the country.**
- 3. The agency should have pool of qualified and trained manpower to operate and conduct the programme**
- 4. The agency should be financially sound to operate such a programme. Dully Certified Average turnover certificate of the agency for last three financial years should be attached.**

5. The agency should have the infrastructure and capacity to launch the programme in entire state in phases within 3 months of appointment.

6. The agency should have capacity and infrastructure to develop hands on resources for science and maths education.

7. Preference will be given to those agencies which have office/infrastructure in Uttarakhand.

Payment Schedule:

Payment will be made on quarterly basis on production of reports of operation duly certified by the head of the schools/institutions covered.

Selection Process:

The Authority has adopted Quality cum Cost Based Selection (QCBS) methodology for selection of Agency and hence the Project will be awarded to the Bidder with the highest Final Score as per process mentioned below. Those agencies who score minimum 70% in Technical bid/Eligibility Criteria will only be considered for opening of financial bid

- Financial proposals of only those agencies who are technically qualified shall be opened publicly on the date and time specified to be notified separately, in the presence of the agency's representatives who wish to attend. Financial proposals will be allotted weightage of 30%.
- Financial proposals will be checked and the bidder will be ranked accordingly. The lowest financial bid would secure 30 marks and the score(s) of the other bidder(s) shall be computed as per illustration cited below:

Bidders	Cost given in the financial bid	Calculation	Normalized Score
Bidder L-1	1000	$1000*30/1000$	30.00
Bidder L-2	1025	$1000*30/1025$	29.27
Bidder L-3	1050	$1000*30/1050$	28.57

- The numerator will be the charges as cost quoted by L-1 and denominator will be the bidder charges as cost quoted by respective bidders.
- **The agency scoring the highest combined score in technical and financial bid evaluation together shall be considered for the work.**
- In the first step, based on the details submitted under the technical Bids/Eligibility Criteria of all the Bidders, as per eligibility criteria of the Tender, technically qualified bidder will be identified.
- **UCOST may ask all bidders to make a presentation and physically present their Labs on wheels facilities which they propose to offer.**
- **Based on the Technical presentation credentials marks will be awarded under following criteria in Technical Bid.**

<i>Evaluation Criteria for Technical Bid</i>		
		Maximum Points
01	Experience in setting Labs on wheel facility in 10 Schools. (attach documentary proof)	10 Points
02	Experience in setting Labs on wheel facility in minimum 02 states. (attach documentary proof)	10 Points
03	Experience and expertise of operation of such a programme. (attach document proof)- Min 05 years of experience	10 Points
04	Quality of Science and Maths resources proposed to be supplied and activities proposed to be organised.(Submit list)- Presentation before the committee will be required	20 Points
05	Capacity of Agency: Technical Manpower & Infrastructure to develop learning resources (Minimum 10 Technical Manpower)	10 Points
06	Innovativeness & Infrastructure (Vehicle & Other for operation)	10 Points
07	Average turnover of the agency of last three F.Y. (2020-21, 2021-22, 2022-23)- Minimum 100.00 Lakh	10 Points
08	Whether the agency is a service provider in	05 Points

	Uttarakhand.	
09	Successfully completion certificate of labs on wheel facility from Government Organization/Institutes/Schools (Minimum 03)	05 Points
10	Whether the agency have submitted required documents (ITR of F.Y. (2020-21, 2021-22, 2022-23), Copy of GST, PAN, Company Registration)	10 Points
	Total	100 Points*

***Agency(s) scoring minimum 70 points will be technically qualified and will be called for opening of financial bid**

- The Financial Bid under the third envelop shall be opened of only those Bidders who qualify as per above eligibility criteria (the “Qualified Bidders”)
- For the avoidance of doubts, the Technical Bid shall consist of the documents specified in this RFP in the note contained below Section –IV and absence of any of the documents and particulars will cause the Bid to be declared as non-responsive. The Authority reserves the right to reject any Bid which is non-responsive and no request for alteration, modification, substitution or withdrawal shall be entertained by the Authority in respect of such Bid. Provided, that the Authority may, in its discretion, allow the Bidder to rectify any infirmities or omissions if the same do not constitute a material modification of the Bid.
- Technical and Financial Bids shall be evaluated based on parameters specified in the RFP document. Based on the technical bid, and financial bid, technical and financial scores respectively shall be given to each Bidder. The technical score will be awarded as per the criteria given Section-III above. Financial Bid shall comprise of the total fee for the services quoted as per Financial Bid Format, and the Bidder quoting the lowest aggregate fee will get the maximum financial score of 30. The Project will be awarded to the Bidder with highest Total Score (hereinafter referred to as "**Selected Bidder**")

The Bidder achieving the highest combined technical and financial score may be invited for negotiations for awarding the contract. In the event that 2 (two) or more Qualified Bidders have the same overall Total Score (the "Tie Bidders") for the Project, the Qualified Bidder shall be identified as the bidder which has the higher technical score among the bids in the tie.

After selection, a Letter of Award (the "LOA") shall be issued, in duplicate, by the Authority to the Selected Bidder and the Selected Bidder shall, within 7 (seven) days of the receipt of the LOA, sign and return the duplicate copy of the LOA in acknowledgement thereof. In the event the duplicate copy of the LOA duly signed by the Selected Bidder is not received by the stipulated date, the Authority may, unless it consents to extension of time for submission thereof, appropriate the EMD of such Bidder as damages on account of failure of the Selected Bidder to acknowledge the LOA, and the next eligible Bidder may be considered.

After acknowledgement of the LOA as aforesaid by the Selected Bidder(s), UCOST, pursuant to this RFP, the successful bidder will have to deposit 10% of the order value as EMD in the form of Account payee demand draft on term deposit receipt on unconditional bank guarantee valid for a period of one year before placement of a Work Order.



Uttarakhand State Council for Science & Technology
Vigyan Dham, Jhajra, Chakrata Road,
Dehradun -248015 (Uttarakhand)

Proforma for agencies capable in providing Services of “ Lab on Wheels”
(Additional sheets may be attached for detailed information, wherever necessary)

1.	Name of the Agency/Firm/Organisation	
2.	Full Postal Address	
3.	Telephone Nos.	
4.	E-mail	
5.	a. PAN b. Registration No. c. GST Reg. No. (Please attach copies)	
6.	Type of Organisation(Please attach Bye-Laws, registration certificate, whichever is applicable)	
7.	Name of the Professional Qualification of the Chairman/head and Board members	
8.	Number of Professionally qualified staff employed in the organisation & qualification of staff manning the Mobile lab programme	
9.	No. of subordinate staff employed in the organisation	
10.	Whether the organisation has in-house expertise to develop hands-on and experiential learning resource material. List of resource material developed be annexed.	
11.	If there is no in-house facility, name & full address of its associate and the no. of	

	professionally qualified staff with the associate. List of resource material that would to be procured be annexed.	
12.	Details of experience in providing Mobile Science Laboratory for schools/colleges	
13	Experience in providing Mobile Laboratory for Primary/Middle/Secondary/Higher Secondary/College. Please specify.	
13	Whether any evaluation/impact study was conducted on similar mobile laboratory programme. If yes, please attach reports.	
14	List of learning material outreach activities mobile laboratory programme for quality assessment.	
15.	List of State Governments/Clients to whom such services of Mobile Laboratory provided and list of units. Pl attach copies of orders/MOU's/Contracts	
16	Whether the agency has any office/setup in Uttarakhand? If Yes, details thereof	
17	Copies of audited accounts of last three years ending March, 31, 2022 may be attached	
18	Copies of ITR along with balance sheets for last three consecutive years ending March 2022 may be attached.	

Certified that the information furnished above are true to the best of my/ our knowledge. It is hereby declare that I/we will abide by the decision of UCOST on selection of competent agency.

Date:

Signature with office seal & Date

- N.B: 1. Enclosure (s) may be used where the space provided is inadequate.
2. Last date of submission March 20, 2023

Financial Bid

**Uttarakhand State Council for Science & Technology Vigyan Dham, Jhajra,
Chakrata Road, Dehradun -248015 (Uttarakhand)**

Proforma of Financial Bid

Capital (Setup cost) (in INR)

Serial No.	Description	Unit(s)	Lump sum Cost
01	Vehicle for Mobile Lab (BS-VI) including registration, Life tax, permits, GPS, Speed Governor, Artwork, etc. Medium size Buses/Vans (Tempo Traveller 3050 delivery van. with 9.3 ft. Loading space OR Ashok Leyland Bada dost i-4 model with 9.8 ft. Loading space (The van's body will be converted/modified as per lab requirement) are suitable for Uttarakhand considering the roads of Uttarakhand. The buses will be registered in the name of UCOST/Government of Uttarakhand and bus body will be modified/refurbished for the lab. It will be equipped with a mini generator for power supply in rural areas.	01	
02	Refurbishing, Painting, Stickering /branding	01	
03	Science models and Experiments and work Tables (as per list in Annexure-III)	01	
04	Telescope (700 mm focal Length)	01	
05	Laptop (Core I5 16 GB RAM, 1 TB SSD & 14 Inch Minimum Screen)	01	

06	LED/TFT Screen with HDMI & VGA Cable (55 Inch)	01	
07	Induction Training of instructors	02	
08	Miscellaneous/Contingency		
Total Setup cost	01 Unit		
Annual Operating Cost			
10.	Salaries & Allowances of Instructors, Supervisors, driver etc. (Includes PF, Insurance etc.)	Driver (01)	
11.	Instructors (02)State Coordinator(01)		
12.			Programme Cost (Lump sum)
	a) Diesel for daily visits to schools		
	b) Consumables, Model Replacement breakages, etc. for first year		
	c) Communication & Stationary		
	d) School extension program Operation Vasantha centers)		
	e) Vehicle repairs/fuel etc		
	f) Mobile Lab Staff Travel		
	g) Misc. &Contingencies		
	h) Taxes, Permit, Insurance and Registration etc.		
	i) Training, Quality, Monitoring		
	Sub Total		
	12 Governance & Administrative expenses		Lumpsum
	Total Annual Charges in INR		01
	Total Set-up Cost + Annual Charges in INR		01
	Total Set-up Cost + Annual Charges in INR		13 units*

***Note:** Services required may be implemented in entire state in phases. Work will be awarded initially for 1 Yrs, and can be continued on satisfactory performance by the agency. Rate should be frozen for the period of 1 Year. The quantity may be increased or decreased as requirement.

13. Payment Terms:

14. Any other conditions:

Annexure-III

List of Experiments:

Hands-on Sessions (Science & Maths)

Sr.No.	Subject	Class
PHYSICS		
1	Light and optics	6-10
2	Refraction	6-10
3	Sound	6-10
4	Heat	6-10
5	Work ,Power, Energy	6-10
6	Electricity	6-10
7	Magnetism	6-10
8	Measurement	6-10
9	Pressure & density	6-8
10	Force and motion	6-10
11	Astronomy	6-10
SR NO	CHEMISTRY	CLASS
1	Acid and Base	6-10
2	Chemical Reaction	6-10
3	Metals and Non metals	6-10
4	State of matters	6-10
5	Separation Technique	6-10
6	Atomic Structure	9-10
7	Periodic table	6-10
SR NO	BIOLOGY	CLASS
1	Photosynthesis	6-10
2	Respiratory sys.	6-10
3	Circulatory Sys.	6-10
4	Human anatomy	6-10
5	Digestive System	6-10
6	Nervous sys.	6-10

7	Skeletal sys.	6-8
8	Cell & microscope	6-10
9	Transport in plant	6-10
10	Microscope	6-10
SR NO	MATHEMATICS	CLASS
1	Triangles	6-10
2	Quadrilaterals	6-10
3	Circle	6-10
4	Area and Parameter	6-10
5	Solids	6-10

Sr no	Science concepts/Topics	Name of models / apparatus
ASTRONOMY		
1	Eclipses	Solar & Lunar Eclipse demo model
2	Phases of moon	Phases of moon demo model
3	Same face of Moon	Demo model to show why we see same face of Moon
4	Cause of Day and Night / Seasons	Seasons
FORCE AND MOTION		
5	Non Contact force (Centrifugal Force)	Bell and rope model
6	Non Contact force (Centrifugal Force)	water cup rotation ,Centrifuge model , Centrifugal kit (globe model)
7	Magnetic force	Different types of Magnets
8	Electrostatic force	electrostatic force Activity
9	Centre of mass and Gravity	Wheel and slope /Double cone /Nail balancing
10	Acceleration and velocity	Cycloid path/ speed and velocity models
11	Change in motion	Circulatory to oscillatory motion / oscillatory to Circulatory motion
12	Oscillation and vibration ,	Time period (mass and length)/Tuning fork
13	Newton's 1st law of motion	Inertia of rest & Inertia of motion model
14	Newton's 2nd law of motion	Newton's 2nd law wooden model
15	Newton's 3rd law of motion	Newton's 3rd law of motion / Newton car model

SIMPLE MACHINES		
16	Types of Simple machine	lever, (first ,second and 3rd order lever model wooden)
17	Types of Simple machine	Pulley,
18	Types of Simple machine	Wheel and axle,
19	Types of Simple machine	Inclined plane,
SOUND		Daily life Examples
20	Frequency of sound	Straw flute
21	Frequency/ Amplitude	Tuning fork/ straw pipe and funnel
22	What is Resonance?	Resonance model
23	Types of waves	Slinky , Transverse waves with hand rotation model
24	Propagation of sound through solid	Toy phone
25	Property of sound	Reflection of sound model
26	Property of sound	Doppler effect model
LIGHT AND OPTICS		Daily life Examples
27	What is light	Dark box, Magnifying glass
28	Property of light and Optics	Optics kit , Smoke box, Pinhole camera ,
29	Laws of Reflection	Optic kit , Ray box ,Ray pad ,
30	Property of light	Dispersion of light model , Newton colour Disk ,
31	Total internal reflection	Semi-circular glass / optic fibre toy
32	Multiple reflection	Angle between two mirrors ,one object 11 images,
33	Multiple reflection	Deep well
34	Application of reflection	Periscope, Kaleidoscope, Magic box
35	Nature of matter	Transparent / translucent / opaque
36	Reflection & transmission	Reflection & transmission model ,

37	Shadow forming	Umbra and penumbra kit
38	Types of mirrors/lens	Curved mirror, Spherical mirrors (concave and convex) , lenses
39	Refraction	Lateral shift, Beaker & pencil
40	Finding focal length of mirrors/ lenses	Image formation kit with stands /screen /mirrors/lense
41	Property of Image	Principle of Camera model
42	Property of Image	Micro bank / magic flower model
ELECTRICITY AND ELECTROMAGNETISM		Daily life Examples
43	SIMPLE CIRCUIT Board	Electrical kit (13 expts)
44	Effect of Resistance and their conditions	Resistivity wrt length/thickness/matter/heating effect
45	Ohm's law / Series And parallel connection of rheostat	Ohm's law model / variable Rheostat
46	Magnetic field pattern	Magnetic field pattern / field due to straight or circular coil.
47	Effect of magnetic field due to current	Oersted's law / Ampere's law / Faraday's law
48	Fleming's Rule	Fleming's left hand rule /Fleming's right Hand rule
49	Application of Fleming's left hand rule	Simple motor/ DC motor , Blade & coil model
50	Principle of Current Generator	AC & DC Dynamo
ENERGY		Daily life Examples
51	Types of energy and forms of energy	Solar energy kit, Wind mill model ,Hydropower
52	Conservation of energy	KE to PE, Couple Pendulum
53	Momentum	Conservation of momentum
HEAT		
54	Areal expansion in matter	Bi metallic strip , Heat switch
55	Linear expansion in matter	Linear expansion
56	Volumetric expansion in matter	Ball and ring, Hand boiler
57	Heat conductivity in different materials (conduction)	Heat conductivity
58	Convection	beaker, water, KMnO ₄ , straw pipe
59	Radiation	Heat absorption by blackbodies (radio meter)

PRESSURE AND DENSITY		
60	Atmospheric pressure	Magdeburg hemisphere
61	Bernaulis principle	Air blower / Ball and funnel,
	Bernaulis principle	Atomizer
62	Pascal's law	Manometer, Pascal's law
63	Density	Submarine
64	Density	Density bottle
65	Pressure difference application	Syphon system, Fountain
CHEMISTRY		Daily life Examples
66	Acid & Base	Acid base test and their reaction
67	Chemical Reactions	8 types of reaction
68	Periodic table	Periodic table chart
69	Atomic structure	Electronic configuration model ,Ball and Stick Model
BIOLOGY		
70	Cell and microscope	Microscope
71	Sense Organs	Eye ,Ear ,Nose , Tongue with jaw ,skin,
72	Human Anatomy	Human torso (Detachable Parts)
73	Important Internal organs	Brain, Heart, lungs, Kidney
74	Bio working models	Lungs working , Depth perception (Needle) ,Persistence of vision , See own pupil, Reaction time (wooden scale), vision pipe(hole in hand)
75	IMPORTANT SYSTEMS	Respiratory ,Circulatory , Digestive, Nervous, (wooden models with chart) ,skeletal system
77	JOINTS	Foot joint, elbow joint, knee joint , hip joint , shoulder joints / Skeletal system
Models		
1	2 Stroke Petrol Engine/Diesel engine	M2 experiment 64 &66
2	4 Stroke petrol engine/ diesel engine	M2 experiment 65&67

3	Steam engine	
4	Voltaic cell	
5	Moment of inertia	
6	Hook's Law	
7	Electrolysis	
8	Lazy tube	M2 experiment 50
9	Hand rotation / Down Hill race	

Suggestive List (Minimum) of Material for Experiments for Each Lab Van

Glassware

1. Droppers Glass, 4"
2. Petridish Glass, Medium size, Single
3. Petridish Plastic, Medium size, Single
4. Beaker Glass, 1000 ml, Borosil
5. Beaker Glass, 500 ml, Borosil
6. Beaker Plastic, 250 ml, Borosil
7. Beaker Glass, 50 ml, Borosil
8. Beaker Plastic, 500 ml
9. Slides Empty (unused), Box of 50
10. Test tubes Regular/medium size, Borosil
11. Test tubes Boiling, Borosil
12. Conical flask Glass, 250 ml
13. Thistle Funnel Glass, Small
14. Measuring cylinder Plastic, 500 ml
15. Measuring cylinder Plastic, 250 ml
16. Measuring cylinder Plastic, 100 ml
17. Measuring cylinder Plastic, 50 ml
18. Syringe 2 or 3 ml
19. Cover slips Microscope, 10 boxes unit
20. Funnels Glass, Medium size
21. Funnels Plastic, Small
22. Funnels Plastic, Big
23. Bell Jar Glass with lid
24. L Tubes Regular
25. Glass rods Regular
26. Glass trough Regular
27. Glass tubes Regular
28. Round bottom flask Glass, 250 ml
29. Over flow jar Plastic, 250 ml
- Apparatus/Equipment
30. Microscope Olympus (or regular)
31. Tripod stand Regular
32. Wire gauze Regular
33. Spirit lamp Metal
34. Spatula Steel, Regular size
35. Spatula Plastic, Regular size
36. Tongs Regular
37. Forceps Steel, Long
38. Forceps Steel, Small
39. Filter paper Pack of 100 papers
40. Stop watch Digital
41. Stop watch Big, Analog
42. Rubber cork - One hole For conical flask
43. Rubber cork - without holes For test tubes
44. Rubber cork - Two holes For conical flask
45. Rubber cork - One hole For test tubes
46. Test tube stand Plastic
47. Plastic bucket Small
48. Plastic Bucket Big
49. Plastic tray Medium
50. Plastic tokens Size of 2 rupee coin, packet
51. Magnifying Glass Regular
52. Permanent slides (Set) Euglena, Paramecium, Amoeba
53. Bell Small, Temple bell
54. Weighing balance Gram sensitive
55. Spoons Steel
56. Spoons Plastic (pack of 100)
57. Spoons Big
58. Measuring tape Tailors tape
59. Plastic bottle with lid Chocolate container 5 ltr capacity
60. Petrol tube Transparent, in meters
61. Nylon tube White, thick, in meters
62. Mirrors with wooden base 5 x 10 inch, flat
63. Plastic boxes (Smoke box) Rectangular, transparent
64. Test tube holders Regular with wooden handle
65. Plastic bowl Long

66. Plastic bowl 1 liter capacity
67. Motor & pestle Small
68. Hose pipe (Water pipe) Flexible, 1/2 " dia, in meters 14
69. Copper wire Any dia, in meters
70. Cloth bag 2 kg capacity
71. Cardboard Box Shoe box size
72. Marbles Medium size, pack of 10
73. Sponge
74. China dish Porcelain, Small
75. Deflagrating spoon Long
76. Gloves Regular, in pair
77. Goggles Regular
78. Gas Jar Glass, Regular
79. Test tube cleaning brush
80. Thermometers Alcohol, Laboratory
81. Thermometers Clinical
82. Thermometers Digital (Clinical)
83. Thermometers Maximum & Minimum
84. Wash bottles Squeezing bottle, 500 ml plastic
85. Vertical stands For test tubes
86. Red Litmus A pack of 10
87. Blue Litmus A pack of 10
88. Wooden block 10 x 10 x 10 cm, one side rough
89. Delivery tubes for test tubes Glass, with stoppers at ends
90. Plastic plate Regular dining plate
91. Bar magnets Single pieces
92. Wooden block 2 x 2 inch
93. Nuts Small, 1/4 kg pack
94. Bolts Small, 1 inch, 1/4 pack
95. Washers Small, 1/4 kg pack
96. Separating funnel Plastic
97. Sieve For flours
98. Steel plates Dining plate
99. Immersion heater 125 W
100. Flex box Junction box
101. Water bottles 1 liter capacity- Used
102. Tin Black, 250 ml capacity
103. Tin White, 250 ml capacity
104. LED Torch
105. Torch stand
106. Glass Transparent, 10 x 10 cm
107. Frosted Glass 10 x 10 cm
108. Wood pieces Ply wood, 10 x 10 cm
109. Screens
110. Lens/Mirror stand V stand
111. Glass slab Acrylic or Glass
112. Semi circular Glass slab Acrylic or Glass
113. Prism Glass, Medium size
114. Meter stick 1 meter long, any dia
115. Chessboard Without coins
116. Concave mirrors $f=15\text{cm}$
117. Convex mirrors $f=15\text{cm}$
118. Convex Lens $f = 10 \text{ cm}$
119. Concave Lens $f = 10 \text{ cm}$
120. Laser light Good quality
121. Black cloth 3 square meter
122. Globe Medium size
123. Plastic tub Small
124. Flute Wooden
125. Toy drum
126. Toy Guitar
127. Metal rods 20 cm length, 5 mm
128. PVC pipe 2 meters, 3/4 inch
129. Slinky spring
130. Rope Soft, 1 inch thick, 7 meter length
131. Spring Balance 0 - 100 gm
132. Spring Balance 0 - 500 gm
133. Slotted weights 50 - 50 gm set
134. Iron nails 2 inch
135. Nylon cloth 1 square meter
136. TT balls Regular packet
137. Toy car Big size
138. Carrom board coins (Complete set with striker)
139. Magnetic compass Small
140. Hammer Small
141. Horse shoe magnets
142. Needle magnet
143. Ring magnets
144. Strong magnets
145. Battery boxes 6 V, four cell capacity
146. Torch bulbs 1.5 or 2.5 V, pack of 50
147. Bulb holders for torch bulbs (1.5 V)
148. Connecting wire Black, 20 meters
149. Connecting wire Red, 20 meters
150. Switches
151. Crocodile clips Red
152. Crocodile clips Black
153. Electric Tester
154. Voltmeters 0 - 5 V
155. Ammeters 0 - 300 mA
156. Rheostat Big, 0 - 75/100 ohm
157. Bulb 60 W
158. LED bulb All colours
159. Copper rods 1 mm dia, 10 cm length
160. Acrylic pieces 5 x 2 x 1 cm

161. Connecting stands Wooden with two nails
162. Battery eliminator 0 - 12 V
163. Resistors 5 ohm
164. Resistors 2 ohms
165. Nichrome wire Thick in meters (22 gauze)
166. Nichrome wire Thin, in meters (26 gauze)
167. Cycle tube (New)
168. Rubber sheets 2 square foot
169. Cycle pump
170. Tumbler Steel
171. Metal can 1/2 liter capacity
172. Saline tube set Complete set with stoppers
173. Round bottom flask stand
174. Beads Plastic, 1 cm dia, hollow
175. Iron cubes 4 x 4 x 4 cm
176. Iron cubes 3 x 3 x 3 cm
177. Iron cubes 2 x 2 x 2 cm
178. Aluminum cubes 4 x 4 x 4 cm
179. Aluminum cubes 3 x 3 x 3 cm
180. Aluminum cubes 2 x 2 x 2 cm
181. Wooden cubes 4 x 4 x 4 cm
182. Wooden cubes 3 x 3 x 3 cm
183. Wooden cubes 2 x 2 x 2 cm
184. Copper plates For electro plating
- Chemicals/Reagents
185. Iodine solution 500 ml bottle
186. Methanol 500 ml bottle
187. Ethanol 500 ml bottle
188. Sodium bi carbonate 500 gm bottle
189. Sodium carbonate 500 gm bottle
190. Cresol red 125 ml, bottle
191. Methylene blue 125 ml, bottle
192. Soap solution 500 ml bottle
193. Lime water 500 ml bottle
194. Potassium permanganate 500 gm bottle
195. Spirit 5 liter bottle
196. Starch powder 100 gm bottle
197. Benedict's reagent 500 gm bottle
198. Copper sulphate crystals 500 gm bottle
199. Sodium hydroxide pellets 500 gm bottle
200. Hydrochloric acid Dilute HCl, 500 ml
201. Sulphur powder 500 gm bottle
202. Magnesium ribbons Regular
203. Acetic acid 500 ml bottle
204. Calcium chloride 500 gm bottle
205. Zinc flakes 100 gm bottle
206. Copper flakes 500 gm bottle
207. Copper oxide 500 gm bottle
208. Phenolphthalein 125 ml, bottle
209. Lead nitrate 500 gm, bottle
210. Potassium iodide 100 gm, bottle
211. Barium hydroxide 500 gm bottle
212. Ammonium chloride 500 gm bottle
213. Ammonium dichromate 500 gm bottle
214. Vinegar (Bakery made) 500 ml bottle
215. Iron filings 500 gm bottle
216. Acetone 500 ml bottle
217. Iron sulphate 500 gm bottle
218. Baking soda (from general stores) 1/4 kg pack
219. Hydrogen Peroxide 500 ml bottle
220. Manganese dioxide 100 gm
221. Distill water 1 liter bottles Stationary & Consumables
222. Scissors Small
223. Cutters Regular stationary
224. Whistle Sports whistle
225. Straw Straight, pack of 100
226. Straw Bending, Pack of 100
227. Match box Any, Pack of 10 pieces
228. Permanent markers Any colour
229. Napkins or wiping cloths 16
230. Vaseline Small bottles
231. Thread Regular, Rolls
232. Tissue Papers Pack of 100 tissues
233. Graph sheets A4 size, bundle of 50
234. Pencils Pack of 10
235. Erasers Pack of 10
236. Sharpeners Pack of 10
237. A4 sheets Rim
238. Balloons Medium size packet
239. Transparent colour sheets (All colours- 5each)
240. Black chart paper
241. Tea cups Regular packet
242. Polythene covers 3x5 inches, pack of 100 gm
243. Water glasses Plastic, transparent pack
244. Cardboard sheets Brown, Thick
245. Cello tape 2" dia
246. Blades Pack of 10 pieces
247. Painting brush 0 size
248. Scales Plastic, 30 cm long
249. Ice cream sticks Pack of 50
250. gm 250 Chart papers Set of 10 charts incl all colours
251. Bell pins Regular, box/packet
252. Fevicol 50 gm
253. Candles Big
254. Candles Medium size pack of 5

- 255. Chalk Coloured, box
- 256. Incense sticks Pack
- 257. Glucose Regular packet
- 258. Sugar 1/4 kg pack
- 259. Salt 1 kg packet
- 260. Sketch pens-A pack of 12 pens
- 261.. Wax 1/4 kg pack
- 262. Sand paper
- 263. Hand wash Dettol,
- 264. Cotton Regular rolls
- 265. Washing soap Rin/Vim or any - regular size
- 266. Washing powder Any, 250 gm packet
- 267. Paper plates Medium size, pack of 50 plates
- 268. Stapler pins Regular
- 269. Coconut oil 250 ml bottle
- 270. Aluminum foil Regular rolls
- 271. Table paper Steel colour, in roll

Exhibits/Models/Kits

- 1. Eclipse
- 2. Phases of moon
- 3. Same face of moon
- 4. Seasons
- 5. Centrifugal force kit
- 6. Centripetal force kit
- 7. Double cone
- 8. Inertia at Rest
- 9. Inertia at Motion
- 10. Newton 3rd law (tin ,thread, water)
- 11. Newton 3rd law (Wooden plank & spring balance)
- 12. Time period (Mass, Length & Amplitude))
- 13. Speed & Velocity Model
- 14. Transverse waves with hand rotation
- 15. Longitudinal waves (Slinky toy)
- 16. Resonance
- 17. Tuning fork set
- 18. Doppler effect
- 19. Optics kit (for minimum 10 experiments)
- 20. Smoke box (2 laser pointers, plane mirror, rough surface stand, lens and mirror stand)
- 21. Umbra penumbra stands
- 22. Pinhole camera
- 23. Periscope
- 24. Kaleidoscope
- 25. Lateral shift
- 26. Newton color disc
- 27. Light Ray Board
- 28. Electrical kit (for at least 10 experiments)

- 272. Butter paper A pack of 50
- 273. Plastic ball Cricket ball size, smooth
- 274. Plastic ball Large
- 275. Thermocol balls Regular size packets
- 276. Compass Geometric/Maths
- 277. Protractors Geometric/Maths
- 278. M seal Regular, single packs
- 279. Rubber bands Big, A pack of 100 gm
- 280. Rubber bands Small, A pack of 100 gm
- 281. Cells 1.5 V Small (Torch cells)
- 282. Cells 1.5 V, Big
- 283. Safety pins Big, pack of 10
- 284. Hair pins Regular, A pack of 10
- 285. Camphor Regular packet
- 286. Red buttons Shirt buttons
- 287. Blue buttons Shirt buttons
- 288. Yellow buttons Shirt buttons
- 289. Insulation tapes

- 29. Levitron(Magnetic levitation experiment)
- 30. Electrolysis kit
- 31. Solar energy kit
- 32. Bi metallic strip
- 33. Heat switch
- 34. Ball and ring
- 35. Heat conductivity
- 36. Linear expansion
- 37. Convection
- 38. Heat absorption by blackbodies(radio meter)
- 39. Magdeburg hemisphere
- 40. Manometer
- 41. Submarine
- 42. Density by different liquid
- 43. Syphon system
- 44. Surface tension with soap bubbles
- 45. Conservation of momentum (Newton cradle)
- 46. Conservation of momentum
- 47. Conservation of energy (P.E & K.E)
- 48. Couple pendulum (energy transfer)
- 49. Cycloid path
- 50. Moment of inertia
- 51. Moment of inertia (hand rotation)
- 52. Inclined Plane Model
- 53. Lever/pulleys Models
- 54. Wedge Sets
- 55. Circular Motion
- 56. Curved mirror
- 57. Art bank
- 58. Deep well Modified - New version - TLM
- 59. One object eleven images

60. Steam engine
61. Paper tub
62. Simple Voltaic Cell
63. Blade and coil
64. AC & DC Dynamo Modified
65. Simple motor
66. Flemings' Left hand rule
67. Flemings' Right hand rule
68. Oersted law
69. Solenoid
70. Faradays laws
71. Wind mill
72. Optic Fibers
73. Lazy tube-Eddy current
74. Colour shadows
75. Properties of Concave mirror
76. Angular mometum
77. Hand battery
78. Sliding Kalaeidoscope
79. Magnetic field around different shapes of magnets Biology
80. Brain
81. Eye model
82. Depth perception
83. Persistence of vision
84. Reaction time
85. See your own pupil
86. Heart model
87. Skeletal system
88. Lung model
89. Working principle of Lung expansion
90. Human Torso
91. Human Jaw - Small
92. Human Kidney Model
93. Vision pipe
94. Foot joint
95. Elbow joint
97. Shoulder joint
98. Hip joint
99. Knee Joint
100. ADP & ATP – Inter-conversion Chemistry
101. Electronic configuration model
102. Plasma Ball- ionisation of gases
103. Mini Robot
104. Maths kits to explain area, volume, Pythagoras theorem, numbers etc.

Charts

1. Circulatory system
2. Digestive system
3. Respiratory system
4. Nervous systems
5. Skeletal system
6. Muscular system
7. Sense organs
8. Solar System
9. Parts of a plant/flower
10. Periodic Table
11. Eye and Ear illustrative chart
12. Water Cycle
13. Telescope illustrative (reflective & refractive)
14. Green House Effect(Global warming)
15. Photosynthesis
16. Atomic structure
17. Human Brain and its parts

General Items

1. Steel Tables
2. Badminton Wires Bundle
3. Crates/Large trays with lids for material
4. Calculator
5. Chalk Colour, Regular Box
6. Chalk White, Regular Box & duster
7. First Aid Kit
8. Plastic Brush - Washing
9. Plastic Bucket 10 ltrs
10. Plastic Jug
11. Log Book
12. Air Blower
13. Fire extinguisher
14. LCD TV
15. DVD PLAYER
16. Mats Big
17. Power board
18. Portable generator 1KW
19. Tool Box(mechanical) with drill machine
20. Took kit (electronics) with multimeter