



# केन्द्रीय माध्यमिक शिक्षा बोर्ड

( शिक्षा मंत्रालय, भारत सरकार के अधीन एक स्वायत्त संगठन )

## CENTRAL BOARD OF SECONDARY EDUCATION

(An Autonomous Organisation under the Ministry of Education, Govt. of India)



CBSE/AFF/2022

Dated 04.10.2022  
Circular no. 11/2022

To,  
All the Heads of Schools

**Subject: Recommendation of infrastructure and facilities in the Laboratories and Library & Sports**

Dear Principals,

The National Education Policy 2020 has emphasized the importance of hands on learning and learning by doing, besides ensuring that the school becomes a centre for holistic development of students. Laboratories, library and Sports are integral to the learning process in a school.

Laboratories aim to create opportunities to provide students with hands-on experience of laboratory experiments, to bridge the gap between theoretical concepts and their application in everyday life. Students can also learn technological and scientific skills if they participate in various laboratory exercises.

Library plays a fundamental role in learning process and holistic development of students. It provides various academic resources, such as educational materials, trainings courses, scientific publications, technological research etc. Library also plays important role to develop communication skills (reading, writing, speaking and listening) amongst the students.

Sports develop the various skills in the students like patience, discipline, learning from failure, Sportsmanship, teamwork, leadership etc. and contribute to the physical & mental well being of students.

In the light of the above, CBSE has issued guidelines on the minimum infrastructure requirement for Labs, Library and Sports facilities in CBSE Affiliated schools, in consonance with its Bye-Laws.

Besides the above, the board has also laid down SOPs, do's and don'ts for these workspaces, which the schools, students, teachers and other staff should follow to ensure their safety and well being.

These guidelines have been issued for the following categories:

1. Composite Science Laboratory (Compulsory for Secondary and Senior Secondary both schools Exclusively for students of Secondary classes)
2. Physics Laboratory (Compulsory for students of Physics subject of Senior Secondary schools)
3. Chemistry Laboratory (Compulsory for students of Chemistry subject of Senior Secondary schools)
4. Biology Laboratory (Compulsory for students of Biology subject of Senior Secondary schools)
5. Mathematics Laboratory (Compulsory for Middle, Secondary and Senior Secondary schools)
6. Computer Science Laboratory (Compulsory for Middle, Secondary and Senior Secondary schools)
7. Library (Compulsory for Middle, Secondary and Senior Secondary schools)
8. Sports Infrastructure (Compulsory for Middle, Secondary and Senior Secondary schools)

It is recommended that all the affiliated schools with CBSE and the schools seeking affiliation with the Board may follow the SOPs / guidelines (see Annexure) of Physics, Chemistry, Biology, Mathematics, Computer Science, Composite Science Laboratories and Library & Sports infrastructure.

Anurag Tripathi

(Anurag Tripathi)  
Secretary, CBSE



**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Composite Science  
Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## 1. Introduction:

Laboratories aim to create opportunities to provide students with hands-on experience of laboratory experiments, which could bridge the gap between theoretical concepts and their application in everyday life. The laboratory performance is based on the idea that science focuses on hands-on, minds-on observational activities and that these activities help students make connections between various scientific concepts and real-life experiences. If students are to make use of any technology/ scientific skills in their classrooms, they must learn to make observations, formulate hypotheses, conduct experiments, collect data, use appropriate tools, analyse the data and interpret the obtained results. The practicals enable students to connect to other science areas, communicate the information effectively, and argue their conclusions logically. Students can learn these skills if they can participate in various laboratory exercises. In the study of Science, practicals are given special consideration as they are necessary to stimulate creativity, curiosity and critical thinking among students. Moreover, practicals help increase students' engagement, thus boosting their interest in the subject.

School labs are an excellent place for students which help them enhance their learning by understanding the theoretical concepts of science taught in classrooms. Well-designed laboratories make science experiments fun and help students achieve good academic results. It helps to close the gap in the achievement of learning outcomes, and classroom transactions will shift towards competency-based learning and education. Hence, a well-equipped Science Laboratory is required in every school to:

- Make learning Holistic, Integrated, Enjoyable, and Engaging
- Develop conceptual understanding giving a strong emphasis on Experiential learning in all stages of science education to move toward Competency-focussed education.
- Provide opportunities to students for hands-on learning to observe, experiment and innovate
- Fulfill curricular expectations in a holistic manner
- Create and facilitate a culture of research from the school level itself
- Promote collaborative learning

## 2. Curricular expectations

At this stage learners are expected to:

- Develop understanding of concepts, principles, theories, and laws governing the physical world, consistent with the stage of cognitive development.
- Develop ability to acquire and use the methods and processes of science, such as observing, questioning, planning investigations, hypothesizing, collecting, analyzing and interpreting data, communicating explanations with evidences, justifying explanations, thinking critically to consider and evaluate alternative explanation, etc.
- Conduct experiments, also involving quantitative measurements.
- Appreciate how concepts of science evolve with time giving importance to its historical prospective.
- Develop scientific temper (objectivity, critical thinking, freedom from fear and prejudice, etc.).
- Nurture natural curiosity, aesthetic sense, and creativity.
- Imbibe the values of honesty, integrity, cooperation, concern for life and preservation of environment.
- Develop respect for human dignity and rights, equity and equality.

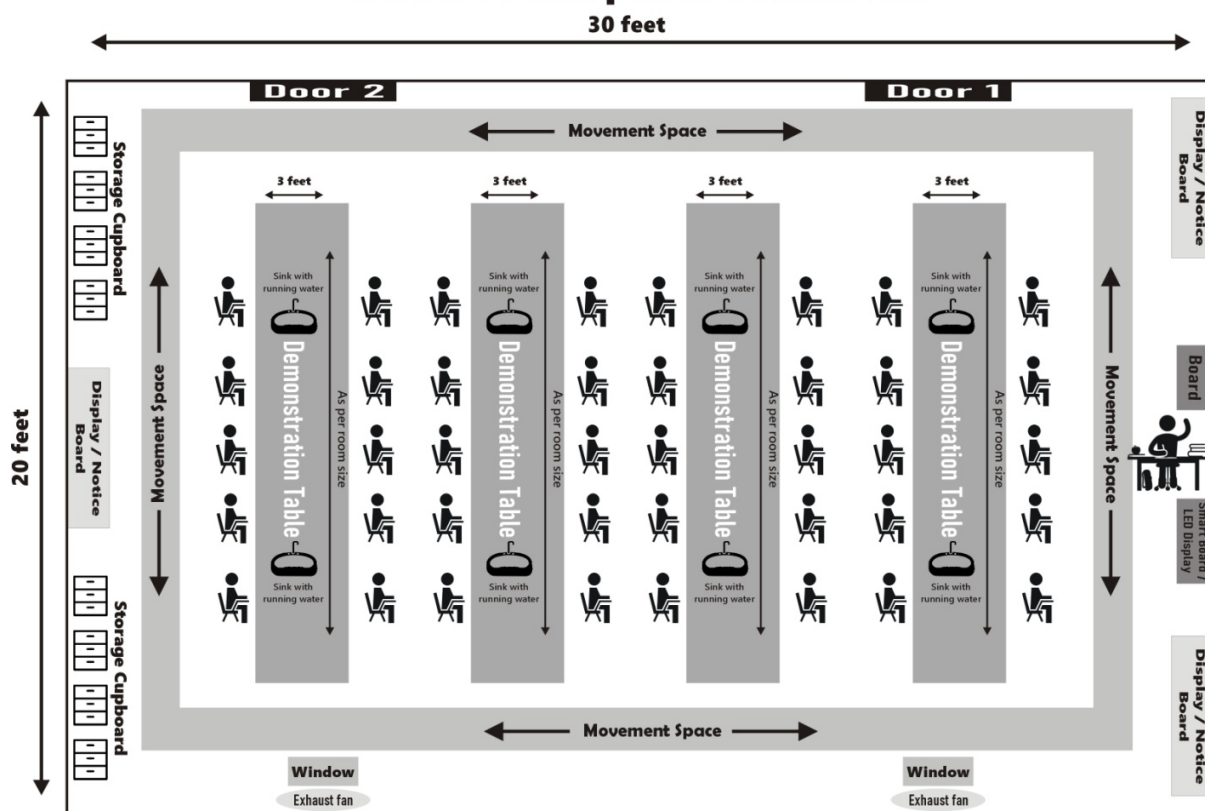
### 3. Pedagogy of Science education as recommended by National Education Policy 2020:

- Chapter 4 of NEP 2020 'Curriculum and Pedagogy in Schools: Learning Should be Holistic, Integrated, Enjoyable, and Engaging' has laid a wide emphasis on Experiential learning in all stages of science education in Para 4.6.
- Chapter 7 of NEP 2020 in Para 7.5 has mentioned the importance of well-equipped science laboratories for strong science education.
- According to Para 12.1 Effective learning requires a comprehensive approach that involves appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support. The curriculum must be interesting and relevant, and updated regularly to align with the latest knowledge requirements and to meet specified learning outcomes which can be made possible by well-equipped science laboratories.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Composite Science Laboratory in schools. The present SOP also illustrates adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempt to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

### 4. Model Layout of Composite Science Laboratory

#### Model of Composite Science Lab



## 5. Infrastructure needed for Composite Science Laboratory:

### Recommendations for Infrastructure

S. No.	Category / Materials needed	Requirements
1	Physical Infrastructure	<ul style="list-style-type: none"> <li>Minimum Lab. Room size 600 Sq.ft.</li> </ul>
2	Storage	<ul style="list-style-type: none"> <li>A separate room or cupboards within lab for consumables and non- consumables items in the lock and key mechanism, thus ensuring a safety, dust and vermin-free environment.</li> </ul>
3	Teaching facility	<ul style="list-style-type: none"> <li>Preferably an intelligent board with an internet Facility or white / green board.</li> </ul>
4	Demonstration Table	<ul style="list-style-type: none"> <li>The demonstration table should also have a sink along with a water tap. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher.</li> <li>40 seating facilities (lab stools)</li> </ul>
5	Display / Notice Board	<ul style="list-style-type: none"> <li>Do's &amp; Don'ts/ rules for the laboratory use/ safety procedures</li> <li>List of practical activities</li> <li>Timetable- (laboratory timetable)</li> <li>Emergency Contact numbers</li> </ul>
6	Gas/ heating	<ul style="list-style-type: none"> <li>Preferably gas pipeline. (2 heating burners)</li> </ul>
7	Sink with Water supply	<ul style="list-style-type: none"> <li>8 sinks with water supply</li> </ul>
8	Waste management	<ul style="list-style-type: none"> <li>02 bins to be installed for biodegradable and non - biodegradable waste.</li> <li>Flammable chemicals bottles must be packed separately. Empty chemical bottles can be packed in cartons/sacks. Disposal must be sent to the Material Management Division of the school.</li> </ul>
9	Fire extinguisher	<ul style="list-style-type: none"> <li>To be installed at a prominent place within the laboratory or in the corridor outside the laboratory.</li> </ul>
10	Exhaust fans	<ul style="list-style-type: none"> <li>2 in number</li> </ul>
11	Medical First Aid Kit	<ul style="list-style-type: none"> <li>2 in number</li> </ul>
12	Heating facility	<ul style="list-style-type: none"> <li>One Heater should be available in the lab to conduct Heat related experiments</li> </ul>

## 6. Minimum requirement of equipment / items for a Composite Science laboratory

### a) List of Non-Consumable Items (for a batch of 40 students):

S. No	Materials Required	Requirement	S. No	Materials Required	Requirement
1	Assembled Microscope	10	26	Concave Lens	10
2	Test Tubes	10	27	Separating Funnel	10
3	Boiling Tubes	20	28	China Dish	10
4	Beakers (100ml)	10	29	Petri Dish	10
5	Beakers (500ml)	5	30	Needles (To keep the Coverslips)	10
6	Conical Flask	5	31	Laboratory Thermometer	10
7	Tripod Stand	10	32	Spring Balance (0-250 gm)	4
8	Wire Gauze	10	33	U-Shaped Magnet	5
9	Filter Paper	10 Boxes	34	Specimens	20
10	Assembling Box (Wooden Box for keeping Few Things)	5	35	Permanent Slides	80
11	Funnel (Small) (Both Glass and Plastic one)	10+10	36	Pin Hole Camera	4
12	Funnel (Big) (Both Glass and Plastic one)	5+5	37	Kaleidoscope	5
13	Spatula	20	38	Magnetic Compass	5
14	Round Bottom Flask (Small)	5	39	Bar Magnet	10
15	Laboratory Thermometer	10	40	Iron Fillings	4 Boxes
16	Glass Rod	10	41	Iron Stand	4
17	Droppers (Big+Small)	10+10	42	Thumb Pins	2 Box
18	Deflagrating Spoon	5	43	Bunsen Burners	To be attached to gas supply accordingly
19	Plane Mirrors	10	44	Glass prism	4
20	Stands for plane Mirrors	10 Pairs	45	Gas Jar	4
21	Test Tube Holder	10	46	Pair of Tongs	5
22	Scissors	4	47	Laptop/ Desktop Set	2 set up
23	Charts for Display	15	48	Convex Mirror	10
24	Portraits (as per choice)	20	49	Convex Lens	10
25	Concave Mirror	10			

**b) List of Consumable Items (for a batch of 40 students at any given time):**

S. No	Materials Required	Requirement
1	Hand Wash	2 Bottles
2	Hand Sanitizer	2 Bottles
3	Iodine Solution	200 ml
4	Copper Sulphate	200 gm
5	Sodium Hydroxide pallets	200 gm
6	Matchboxes	3
7	Slides	10 Boxes
8	Cover Slips	10 Boxes
9	Alcohol	1000 ml
10	Litmus Paper (Red and Blue)	20 Booklets Each
11	Sodium Chloride	2000gm
12	Hydrochloric Acid (Both Dilute and Concentrated)	200 ml each
13	Methyl Orange	2 Bottle
14	Phenolphthalein	2 Bottle
15	Lime Water	
16	Magnesium Ribbon	4 Coils
17	Sulphur Powder	200 gm
18	Zinc Granules	2 Bottle

**c) Biological Science requirements (for a batch of 40 students at any given time):**

S. No.	Specimen Required	Number
1	Insectivorous Plants	3
2	Hydrilla	2
3	Model of different types of teeth	2
4	Model of a Simple pendulum	2
5	Life Cycle of Silkworm	2
6	Root Nodules (Rhizobium)	2

#### d) Equipments and items Requirements (for a batch of 40 students at any given time):

S. No.	Permanent Slides Required	Number
1	Different Shapes of Bacteria (Bacilli, Cocci, Spirilla)	2 Each
2	Amoeba	2
3	Amoeba- Binary Fission	2
4	Hydra	2
5	Bread Mould	2
6	Spirogyra	2
7	Budding in Yeast	2
8	Paramecium	2
9	Chlamydomonas	2

#### 7. Safety guidelines

In order to ensure the safety of students in Science Laboratories, the following provisions are mandatory:

##### ➤ List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- It should be ensured that gas fittings in the laboratory fulfill the desired norms and standards.
- Periodical checking of electrical fittings/ insulations for replacement and repairs
- Timely and repeated instructions to students for carefully handling chemicals and equipment in the laboratory.
- Display of do's and don'ts in the laboratory at prominent places.
- Safe and secure storage of all chemicals and equipments.
- Proper labelling and upkeep of chemicals and equipments.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Careful supervision of students while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.



➤ **General work procedure for students**

- When entering a laboratory, avoid touching equipment, chemicals, electrical and electronic devices, or other materials until you are instructed to do so.
- The students should be careful when doing electricity experiments.
- He/she should not touch any wires if his/her hands are wet, even for low voltage equipment.
- Follow all written and verbal instructions carefully given by the teacher/ instructor.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, breakage or injury, report to the teacher instantly: stay calm.
- Do not taste or smell any chemical present in the laboratory.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet / socket.
- Never return unused chemicals to their original container.
- Do not take any chemicals away from the laboratory premises.
- Do not immerse hot glassware in cold water, as the glassware may break. Put the heated glassware in a different place to be cooled.
- Never look into a container that is being heated. Always observe containers from sideways.
- If the Bunsen burner goes out accidentally, immediately turn off the control device/ gas supply.
- Never leave a lit burner unattended.
- Wash your hands with liquid soap and water on leaving the laboratory.

**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Physics Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## 1. Introduction

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In the study of Physics, practicals are given special consideration as they are necessary to stimulate creativity, curiosity and critical thinking among students. Moreover, practicals help increase students' engagement, thus boosting their interest in the subject. School labs are an excellent place for students which help them enhance their learning by understanding the theoretical concepts of science taught in classrooms. Well-designed laboratories make science experiments fun and help students achieve good academic results. It helps to close the gap in the achievement of learning outcomes, and classroom transactions will shift towards competency-based learning and education. Hence, a well-equipped Science Laboratory is required in every school to:

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- Provide opportunities to students for hands-on learning to observe, experiment and innovate
- Fulfill curricular expectations in a holistic manner
- Create and facilitate a culture of research from the school level itself
- Promote collaborative learning.

## 2. Curricular expectations:

**As per the NCERT Learning Outcomes at Senior Secondary Stage, at this stage Learners are expected to:**

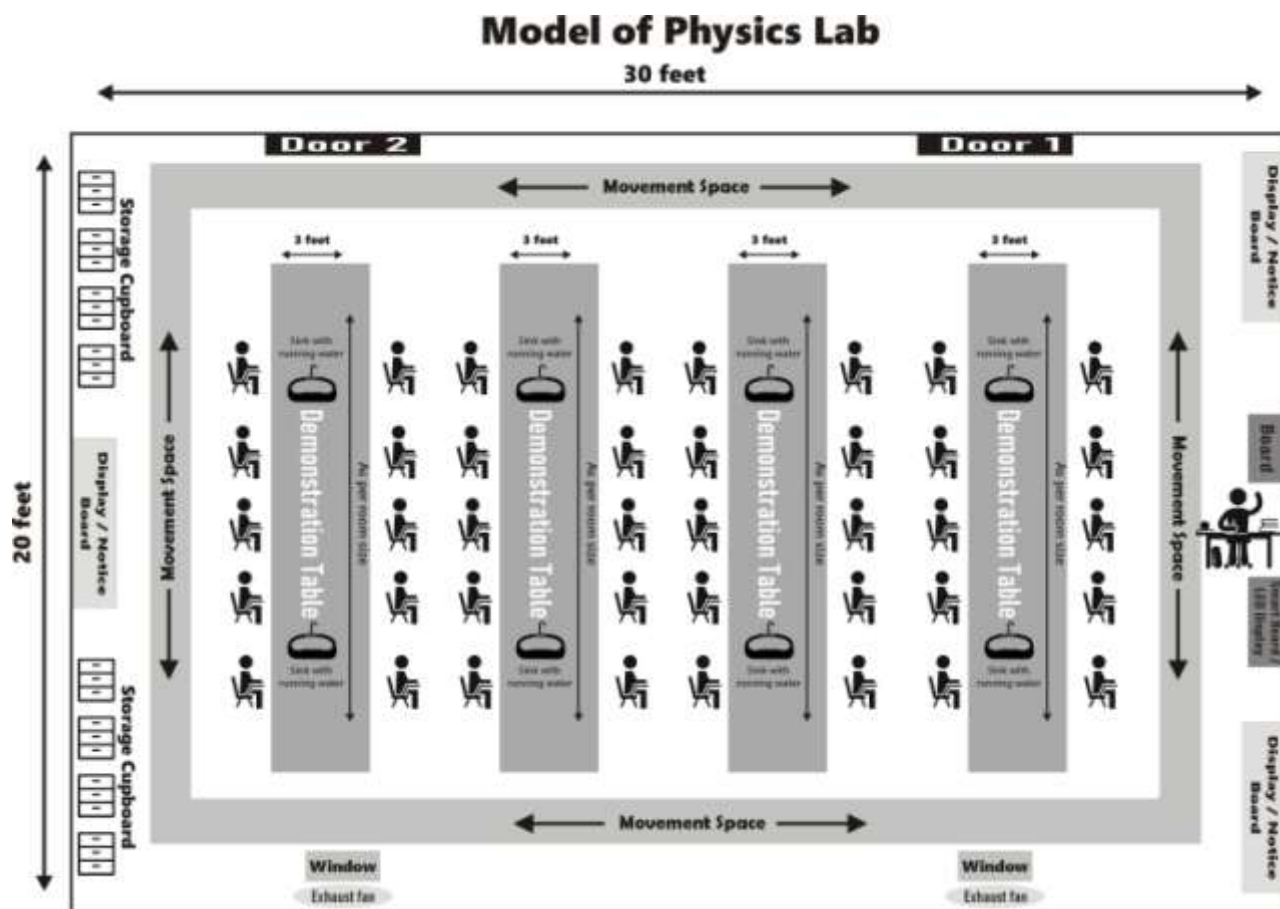
- develop interest to study physics as a discipline;
- strengthen the concepts developed at the secondary stage to acquire firm ground work and foundation for further learning of Physics more effectively and learning the relationship with real life situations;
- apply reasoning to develop conceptual understanding of Physics concepts;
- realize and appreciate the interface of Physics with other disciplines
- get exposure to different processes used in Physics-related industrial and technological applications;
- develop process-skills and experimental, observational, manipulative, decision-making and investigatory skills;
- synthesize various science/physics concepts to solve problems and thinking critically in the process of learning Physics;
- understand the relationship between nature and matter on scientific basis, develop positive scientific attitude, and appreciate the contribution of Physics towards the improvement of quality of life and human welfare;
- comprehend the contemporary knowledge and develop aesthetic sensibilities.
- appreciate the role and impact of Physics and technology, and their linkages with
- overall national development.

### 3. Pedagogy of Science education as recommended by National Education Policy 2020:

- Chapter 4 of NEP 2020 'Curriculum and Pedagogy in Schools: Learning Should be Holistic, Integrated, Enjoyable, and Engaging' has laid a wide emphasis on Experiential learning in all stages of science education in Para 4.6.
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- According to Para 12.1 Effective learning requires a comprehensive approach that involves appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support. The curriculum must be interesting and relevant, and updated regularly to align with the latest knowledge requirements and to meet specified learning outcomes which can be made possible by well-equipped science laboratories.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Physics Laboratory in schools. The present SOP also illustrate adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempt to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

### 4. Model Layout of Physics Laboratory



## 5. Infrastructure needed for Physics Laboratory:

### Recommendations for Infrastructure

S. No.	Category / Materials needed	Requirements
1	Physical Infrastructure	<ul style="list-style-type: none"><li>• Minimum Lab. Room size 600 Sq.ft.</li></ul>
2	Storage	<ul style="list-style-type: none"><li>• A separate room or cupboards within lab for consumables and non- consumables items in the lock and key mechanism, thus ensuring a safety, dust and vermin-free environment.</li></ul>
3	Teaching facility	<ul style="list-style-type: none"><li>• Preferably an intelligent board with an internet Facility or white / green board.</li></ul>
4	Demonstration Table	<ul style="list-style-type: none"><li>• The demonstration table should also have a sink along with a water tap. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher.</li><li>• 40 seating facilities (lab stools)</li></ul>
5	Display / Notice Board	<ul style="list-style-type: none"><li>• Do's &amp; Don'ts/ rules for the laboratory use/ safety procedures</li><li>• List of practical activities</li><li>• Timetable- (laboratory timetable)</li><li>• Emergency Contact numbers</li></ul>
6	Gas/ heating	<ul style="list-style-type: none"><li>• Preferably gas pipeline. (2 heating burners)</li></ul>
7	Sink with Water supply	<ul style="list-style-type: none"><li>• 8 sinks with water supply</li></ul>
8	Waste management	<ul style="list-style-type: none"><li>• 02 bins to be installed for biodegradable and non - biodegradable waste.</li><li>• Flammable chemicals bottles must be packed separately. Empty chemical bottles can be packed in cartons/sacks. Disposal must be sent to the Material Management Division of the school.</li></ul>
9	Fire extinguisher	<ul style="list-style-type: none"><li>• To be installed at a prominent place within the laboratory or in the corridor outside the laboratory.</li></ul>
10	Exhaust fans	<ul style="list-style-type: none"><li>• 2 in number</li></ul>
11	Medical First Aid Kit	<ul style="list-style-type: none"><li>• 2 in number</li></ul>
12	Heating facility	<ul style="list-style-type: none"><li>• One Heater should be available in the lab to conduct Heat related experiments</li></ul>

## 6. Minimum requirement of equipment / items for a Physics laboratory

### a) List of Non-Consumable Items (for a batch of 40 students):

S. No	Materials Required	Requirement	S. No	Materials Required	Requirement
1	Ammeters different range	10	27	Rheostat	10
2	Battery eliminator	10	28	Resistance coil different range 1-5 ohms)	20
3	Daniell cell	8	29	Resonance apparatus	8
4	Drawing board	30	30	Spherometer	30
5	Friction apparatus complete set with weight box	8	31	Screw gauge	20
6	Galvanometer	10	32	Wooden scale (1-50 cm, 1-100 cm)	10 each
7	Parallelogram apparatus	10	33	Stopwatch	8
8	Key one way	20	34	Sonometer	8
9	Jockey pencil type	10	35	Sprit level	4
10	Two-way key	8	36	Thermometer	10
11	Laclanche cell	8	37	Tuning fork (250 Hz, 480 Hz and 512 Hz) withpad	5 each
12	Meter bridge	8	38	Vernier calliper	20
13	Multimeter digital	4	39	Voltmeter (different range)	20
14	Multimeter manual	4	40	Beakers	10
15	Magnetic compass	10	41	Connecting wires	1 Kg
16	Optical bench (1 meter long)	10	42	Charts for display (bio visuals)	20
17	Prism (Indian glass)	30	43	Portraits (as per choice)	20
18	Potentiometer	8	44	Concave mirror	10
19	Plier	5	45	Convex mirror	10
20	Cutter	5	46	Convex lens	10
21	Screwdriver	5	47	Concave lens	10
22	Scissor	5	48	Wedge knife edge (for sonometer)	10
23	Resistance box (different range 0.1 to 10 ohm) <ul style="list-style-type: none"> <li>• 1 to 10 ohms</li> <li>• 1 to 100 ohms</li> <li>• 1 to 1000 ohms</li> <li>• 1 to 100000 ohms</li> </ul>	5 each	49	Glass slab	30
24	Dry cell 10g (chargeable)	10	50	Pendulum box	20
25	Dry cell charger	8	51	Cork rubber 1.5 inches	20
26	Helical spring apparatus with weights	8	52	Hanger weights 500 gm	8 set

S. No.	Materials Required	Requirement	S. No.	Materials Required	Requirement
53	Insulated copper wire	500 gm	71	Laptop/ desktop set	2 setup
54	Meter tape (1-100 meter)	4 roll	72	Balance ( Physical )	2
55	Soldering iron	4	73	Boyle's law apparatus	2
56	Spring balance (0-250 gm)	10	74	Fortnis Barometer	2
57	U-shaped magnet	5	75	Metallic Cylinders	2
58	Copper calorimeter	2	76	Metal Sphere	2
59	Epidiascope	2	77	SG Bottles	2
60	Newton's Disc	2	78	Grave sand apparatus	2
61	Telescope	2	79	Young's Modulus	2
62	Camera	2	80	Spectrometer	2
63	Barometer tube	2	81	Hydrometer	2
64	Lactometer	2	82	Spirit Level	2
65	Stove (Oil)	2	83	Potentiometer	2
66	Electric bell	2	84	Silk and cat skin pieces	2
67	Proof Plane	2	85	Gold leaf electroscope	2
68	Binoculars	2	86	Tuning fork	2
69	Soldering rods	2			
70	P-N junction diode set up	4			

**b) List of Consumable Items (for a batch of 40 students at any given time):**

S. No.	Equipment	Requirement
1	Ammonium Chloride`	500 gm
2	All Pins 1.5 "	2 Packets
3	Copper Sulphate	500 gm
4	Drawing Pins	6 Packets
5	Thread Rolls	1 Roll

## 7. Safety guidelines

In order to ensure the safety of students in Science Laboratories, the following provisions are mandatory:

### ➤ List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- It should be ensured that gas fittings in the laboratory fulfill the desired norms and standards.
- Periodical checking of electrical fittings/ insulations for replacement and repairs
- Timely and repeated instructions to students for carefully handling equipment in the laboratory.
- Display of do's and don'ts in the laboratory at prominent places.
- Safe and secure storage of all equipments.
- Proper labelling and upkeep of equipments/items.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Careful supervision of students while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.
- Proper location of the laboratories.

### ➤ General work procedure for students

- When entering a laboratory, avoid touching equipment, chemicals, electrical and electronic devices, or other materials until you are instructed to do so.
- The students should be careful when doing electricity experiments.
- He/she should not touch any wires if his/her hands are wet, even for low voltage equipment.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, breakage or injury, report to the teacher instantly: stay calm.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet/ socket.
- Never return unused chemicals to their original container.
- Do not immerse hot glassware in cold water, as the glassware may break. Put the heated glassware in a different place to be cooled.
- Never look into a container that is being heated. Always observe containers from sideways.
- If the Bunsen burner goes out accidentally, immediately turn off the control device/ gas supply.
- Never leave a lit burner unattended.
- Wash your hands with liquid soap and water on leaving the laboratory.



**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Chemistry Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## 1. Introduction

Laboratories aim to create opportunities to provide students with hands-on experience of laboratory experiments, which could bridge the gap between theoretical concepts and their application in everyday life. The laboratory performance is based on the idea that science focuses on hands-on, minds-on observational activities and that these activities help students make connections between various scientific concepts and real-life experiences. If students are to make use of any technology/scientific skills in their classrooms, they must learn to make observations, formulate hypotheses, conduct experiments, collect data, use appropriate tools, analyse the data and interpret the obtained results. The practical enable students to connect to other science areas, communicate the information effectively, and argue their conclusions logically. Students can learn these skills if they can participate in various laboratory exercises. Hence, a well-equipped Science Laboratory is required in every school to:

1. make learning Holistic, Integrated, Enjoyable, and Engaging
2. Develop conceptual understanding giving a strong emphasis on Experiential learning in all stages of science education to move toward Competency-focussed education.
3. provide opportunities to students for hands-on learning to observe, experiment and innovate
4. fulfill curricular expectations in a holistic manner
5. create and facilitate a culture of research from the school level itself

## 2. Curricular Expectations

At the Senior Secondary stage, learners who have opted for Chemistry as one of the disciplines for study are expected to:

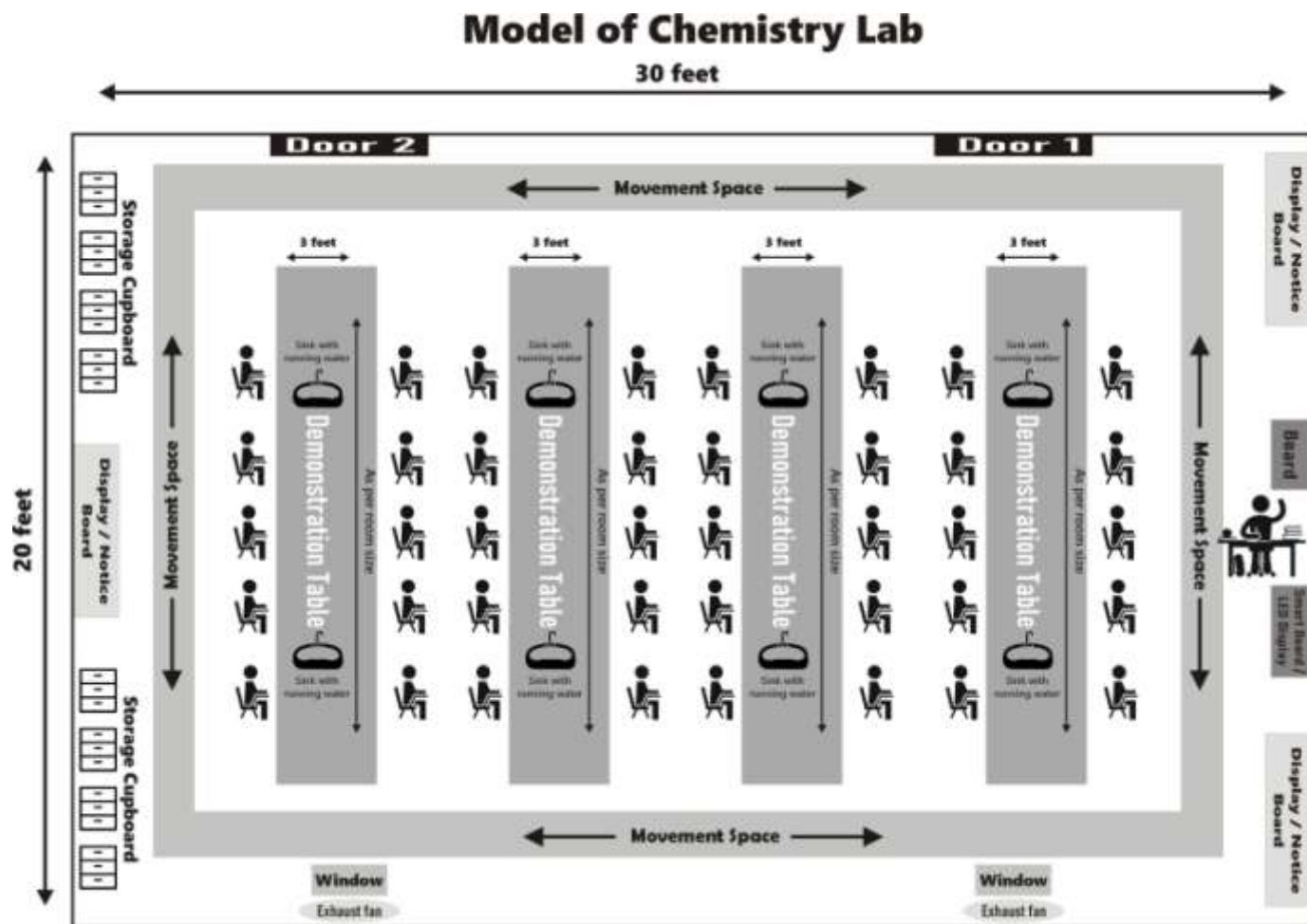
i.	Develop an interest in students to study chemistry as discipline;
ii.	Gain understanding of basic principles in chemistry while retaining the excitement in chemistry;
iii.	Develop per caption for chemistry not only as a discipline of science but make them realize the need and importance in the world around us;
iv.	Strengthens the concepts developed at the secondary stage and to provide firm foundation for further learning of Chemistry at tertiary level more effectively;
v.	Develop ability to acquire and use the methods and processes of science, such as, observing, questioning, planning investigations, hypothesizing, collecting, analysing and interpreting data, communicating explanations with evidences, justifying explanations, thinking critically to consider and evaluate alternative explanation, etc
vi.	Develop positive scientific attitude and appreciate contribution of Chemistry towards the improvement of quality of human life;
vii.	Appreciate how concepts of Chemistry evolve with time giving importance to its historical prospective.
viii.	Develop problem solving skills and nurture curiosity, aesthetic sense and creativity;
ix.	Inculcate values of honesty, integrity, cooperation, concern for life and preservation of the environment;
x.	Makes the learner realize the interface of Chemistry with other disciplines of science such as Physics, Biology, Geology, Geography, Pharmaceutical Science etc;
xi.	Be equipped to face challenges related to health, nutrition, environment, population, whether, industries, agriculture etc;
xii.	Develop respect for human dignity and rights, equity and equality.
xiii.	Develop an appreciation for chemistry as a career option in future.

### 3. Pedagogy of Science education as recommended by National Education Policy 2020:

- i. Chapter 4 of NEP 2020 'Curriculum and Pedagogy in Schools: Learning Should be Holistic, Integrated, Enjoyable, and Engaging' has laid a wide emphasis on Experiential learning in all stages of science education in Para 4.6.
- ii. Chapter 7 of NEP 2020 in Para 7.5 has mentioned the importance of well-equipped science laboratories for strong science education.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Chemistry Laboratory in schools. The present SOP also illustrates adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempts to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

### 4. Model layout of Chemistry Lab:



## 5. Infrastructure needed for Chemistry Laboratory:

### Recommendations for Infrastructure

S.No.	Category/ Materials needed	Requirements
1	Physical Infrastructure	<ul style="list-style-type: none"><li>• Minimum Lab. Room size 600 Sq.ft.</li></ul>
2	Storage	<ul style="list-style-type: none"><li>• A separate room or cupboards within lab for consumables and non- consumables items in the lock and key mechanism, thus ensuring a safety, dust and vermin-free environment.</li></ul>
3	Criteria for Storage Area	<ul style="list-style-type: none"><li>• Store chemicals inside a closable cabinet or on a sturdy shelf with a front-edge lip to prevent accidents and chemical spills. All storage areas have doors with locks. Keep chemical storage areas off-limits to all students. Venti latest or age areas adequately.</li></ul>
4	Teaching facility	<ul style="list-style-type: none"><li>• Preferably an intelligent board with an internet Facility or white / green board.</li></ul>
5	Demonstration Table	<ul style="list-style-type: none"><li>• The demonstration table should also have a sink along with a water tap. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher.</li><li>• 40 seating facilities (lab stools)</li></ul>
6	Display / Notice Board	<ul style="list-style-type: none"><li>• Do's &amp; Don'ts/rules for the laboratory use/safety procedures</li><li>• List of practical activities</li><li>• Timetable-(laboratory timetable)</li><li>• Emergency Contact numbers</li></ul>
7	Gas/heating	<ul style="list-style-type: none"><li>• Preferably gas pipeline.(2 heating burners)</li></ul>
8	Sink with Water supply	<ul style="list-style-type: none"><li>• 8 sinks with water supply</li></ul>
9	Waste management	<ul style="list-style-type: none"><li>• Purchase chemicals in the smallest quantity needed.</li><li>• Use safer chemical substitutes/alternatives such as chemicals determined to be less harmful or toxic.</li><li>• Use micro scale experiments, i.e. micro kits, where Chemical experiments use smaller quantities of chemicals. Recycle chemicals by performing cyclic experiments where one product of are action becomes the starting material of the following experiment.</li><li>• Use pre-weighed or pre measured chemical packets such as chem-capsules that reduce bulk chemical disposal problems (no excess chemicals remain).</li><li>• Do not treat hazardous waste on-site. Contact professional licensed hazardous waste hauliers/transporters that will ensure appropriate disposal.</li><li>• Solid Chemical waste should be disposed of separately in Solids waste Bin which should be adequately covered.</li></ul>

10	Fire extinguisher	<ul style="list-style-type: none"> <li>To be installed at a prominent place within the laboratory or in the corridor outside the laboratory.</li> </ul>
11	Exhaust fans	<ul style="list-style-type: none"> <li>2 in number</li> </ul>
12	Medical First Aid Kit	<ul style="list-style-type: none"> <li>2 in number</li> </ul>
13	Proper Use of Chemical Storage Containers	<ul style="list-style-type: none"> <li>Never use food containers for chemical storage.</li> <li>Make sure all containers are properly closed.</li> <li>After each use, carefully wipe the outside of the container with a paper towel and secure it in the storage area.</li> <li>Properly dispose of the paper towel after use.</li> </ul>
14	Chemical Segregation	<ul style="list-style-type: none"> <li>Store acids in a dedicated acid cabinet.</li> <li>Nitric acid should be stored alone unless the cabinet provides a separate compartment for nitric acid storage.</li> <li>Store highly toxic chemicals in a dedicated, lockable poison cabinet with an obvious sign.</li> <li>Store volatile and odoriferous chemicals in a ventilated cabinet.</li> <li>Store flammables in an approved flammable liquid storage cabinet</li> <li>Store water-sensitive chemicals in a water-tight cabinet in a cool and dry location segregated from all other chemicals in the laboratory.</li> </ul>
15	Fume cupboard	<ul style="list-style-type: none"> <li>One fume cupboard in the laboratory, which is placed away from the work stations for a safety demonstration.</li> <li>A fume cupboard in which harmful and volatile chemical can be used or stored.</li> <li>The fume cupboard ensures a safe atmosphere in the laboratory.</li> </ul>
16	Fume hoods	<ul style="list-style-type: none"> <li>20 numbers at least six ft. wide.</li> </ul>

## 6. Minimum requirement of equipments / items for a Chemistry laboratory

### a) List of Non-Consumable Items (for a batch of 40 students):

S. No.	Metal and Wooden Apparatus/Non-Consumables	If fixed years	S. No.	Metal and Wooden Apparatus/Non-Consumables	If fixed years
1	Balance(Chemical)	5years	24.	Tripod Stand(Iron)	5 years
2	Blow Pipe (Iron)	2 years	25.	Trough(Tin)	2 years
3	Burette Stand(Wooden)	2 years	26.	Wire Gauze(Iron)	1 year
4	Test Tube Brush	1 years	27.	Weight boxes(Wooden)	5 years
5	Cork Borer (Iron)	2 years	28.	Triangular Clay Pipes (Iron wire covered with clay)	4 years
6	Cork Presser(Iron)	5 years	29.	Beehie Sheft	1years
7	Crucible Tongs (Iron)	2 years	30.	Beaker	1 year
8	Charcoal Slab Borer(Iron)	2 years	31.	Burette	3 years
9	Crucible(Silica)	Breakable	32.	China Dish	1 year
10	Deflagrating spoon (Iron)	5 years	33.	Conical Flasks	1 year
11	Distilation Apparatus (Iron)	2 years	34.	Dessicator	5 years
12	Drying Cones (Iron)	5 years	35.	Gas Jar Dises	1 year
13	Funnel stand or filter Stand (Wooden)	2 years	36.	Flasks (R.B. &F.B.)	1 year
14	Pestle and Mortar	2 years	37.	Funnel	1 year
15	Pinch Cock(Iron)	2 years	38.	Gas Jar or Cylinder	2 years
16	Retort Stand with Ring and Clamp	10 years	39.	Glazed Tile	2 years
17	Round File	5 years	40.	Measuring flasks	1 year
18	Sand Bath	5 years	41.	Pipette	1 year
19	Spirit Lamp (Barss)	4 years	42.	Retort	1 year
20	Stoves	5 years	43.	Thistle Funnel	1 year
21	Test Tube Stand(Wooden)	2 years	44.	Woulfe's Apparatus	2 years
22	Test Tube Holder (Iron)	5 years	45.	Kipp's Apparatus	3 years
23	Triangular Stand (Iron)	2 years	46.	Watch Glass	1 year

**b) List of Consumable Items (for a batch of 40 students at any given time):**

S.no	Consumable	Requirement	S.no	Consumable	Requirement
1.	Ammonium carbonate	2kg	28.	Potassium chromate	1kg
2.	Ammonium chloride	2kg	29.	Lead acetate	1kg
3.	Ammonium sulfate	2kg	30.	Sodium sulfate	1kg
4.	Ammonium bromide	1kg	31.	Potassium iodide	1kg
5.	Aluminum sulfate	1kg	32.	Lead nitrate	2kg
6.	Iron sticks	2kg	33.	Cedric ammonium nitrate	200gm
7.	Potassium nitrite	500gm	34.	2,4 DNP	200gm
8.	Ammonium oxalate	1kg	35.	Universal indicator	1Lt
9.	Sodium thiosulphate	1kg	36.	Ammonia solution (NH <sub>4</sub> OH)	3Lt
10.	Zinc sulfate	2kg	37.	Phenol	2Lt
11.	Cobalt nitrate	2kg	38.	Aniline	1Lt
12.	Sodium hydroxide	1kg	39.	Bromine water	1Lt
13.	Copper sulfate	2kg	40.	Acetaldehyde	2Lt
14.	Potassium nitrate	1kg	41.	Acetic acid	2Lt
15.	Oxalic acid	1kg	42.	Fehling solution(A-B)	2Lteach
16.	Magnesium sulfate	1kg	43.	Acetone	2Lt
17.	Magnesium chloride	1kg	44.	Carbon disulfide	1Lt
18.	Ammonium phosphate	2kg	45.	Phenolphthalein	250ml
19.	Sodium chloride	1kg	46.	Nessler's reagent	250ml
20.	Potassium ferrocyanide (K <sub>4</sub> Fe(CN) <sub>6</sub> )	1kg	47.	Ammoniumm olybdate	500gm
21.	Ferrous sulfate	1kg	48.	Nickel carbonate	1kg
22.	Sodium bromide	1kg	49.	Nickel sulfate	1kg
23.	Ammonium ferrous sulfate	2kg	50.	Manganese chloride	1kg
24.	Potassium dichromate	1kg	51.	Calcium chloride	2kg
25.	Barium chloride	1kg	52.	Sodium bisulphate.	500gm
26.	Strontium nitrate	2kg	53.	Cobalt acetate	1kg
27.	Sodium sulfide (Na <sub>2</sub> S)	1kg	54.	Chloroform	1Lt

### List of Consumable Items (for a batch of 40 students at any given time):

S. no	Consumable	Requirement	S. no	Consumable	Requirement
55.	Hydro chloric acid (HCL)	5Lt	70.	Picric Acid	250gm
56.	Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> )	5Lt	71.	Borax	500gm
57.	Nitric acid (HNO <sub>3</sub> )	5Lt	72.	Cobalt Glass	1pcs
58.	Ethanol	3Lt	73.	Aluminum Metal	250gm
59.	Test tube (50/125mm)	5box	74.	Spatula	30pcs
60.	Test tube holder (thick brass)	30pcs	75.	Bunsen burner	30pcs
61.	Dropper glass (150mm)	40pcs	76.	Droppers	50pcs
62.	Funnel (2")	50pcs	77.	Burettes(50ml)	40pcs
63.	Pipette (10ml)bulb tube	40pcs	78.	Wire gauge	40pcs
64.	Conical flask (250ml)	20pcs	79.	Watch Glass	40pcs
65.	Volume tric flask (100ml)	40pcs	80.	Spatula	30pcs
66.	Filter paper(12.5cm)	10pkt	81.	Tripod Stand	30pcs
67.	Glass rod(thick)	10pcs	82.	Burette stand	30pcs
68.	Plain white labels (2/1)	3pkt	83.	Laboratory thermometer (-10°C to 110 °C)	30pcs
69.	Sodium sulfite (Na <sub>2</sub> SO <sub>3</sub> )	1kg			

## 7. Safety guidelines

In order to ensure the safety of students in Science Laboratories, the following provisions are mandatory:

### ➤ List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- Periodical checking of electrical fittings/insulations for replacement and repairs
- Timely and repeated instructions to students for carefully handling chemicals and equipment in the laboratory.
- Safe and secure storage of all chemicals.
- Proper labeling and up keep of chemicals.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.



➤ **General work procedure for students**

- When entering a laboratory, avoid touching equipment, chemicals, electrical and electronic devices, or other materials until you are instructed to do so.
- Follow all written and verbal instructions carefully given by the teacher/ instructor.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, break age or injury, report to the teacher instantly: stay calm.
- Do not taste or smell any chemical present in the laboratory.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet/socket.
- Never return unused chemicals to their original container.
- Do not take any chemicals away from the laboratory premises.
- Do not immerse hot glassware in cold water, as the glassware may break. Put the heated glass ware in a different place to be cooled.
- Never look in to a container that is being heated. Always observe containers from sideways.
- If the Bunsen burner goes out accidentally, immediately turn off the control device/ gas supply.
- Never leave a lit burner unattended.
- Wash your hands with liquid soap and water on leaving the laboratory.

**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Biology Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## 1. Introduction:

In the study of Biology, practicals are given special consideration as they are necessary to stimulate creativity, curiosity and critical thinking among students. Moreover, practicals help increase students' engagement, thus boosting their interest in the subject. School labs are an excellent place for students which help them enhance their learning by understanding the theoretical concepts of science taught in classrooms. Well-designed laboratories make science experiments fun and help students achieve good academic results. They help to close the gap in the achievement of learning outcomes so that classroom transactions will shift towards competency-based learning and education. Hence, a well-equipped Science Laboratory is required in every school to:

- Make learning Holistic, Integrated, Enjoyable, and Engaging
- Develop conceptual understanding giving a strong emphasis on Experiential learning in all stages of science education to move toward Competency-focussed education.
- Provide opportunities to students for hands-on learning to observe, experiment and innovate
- Fulfill curricular expectations in a holistic manner
- Create and facilitate a culture of research from the school level itself
- Promote collaborative learning

## 2. Curricular expectations

At the Senior Secondary stage, learners who have opted for biology as one of the disciplines for study are expected to:

i.	Identify and develop an understanding of concepts, principles, theories, and laws governing the physical world around a biological entity.
ii.	Develop the ability to acquire and use the methods and processes of science, such as observing, questioning, planning investigations, hypothesizing, and collecting, analysing and interpreting data, communicating explanations with evidence, justifying explanations, and thinking critically to consider and evaluate alternative explanations in the biological perspectives.
iii.	Build upon the perceptive of essential tools and techniques used in concepts to analyse various issues in biology.
iv.	Conduct experiments also involving quantitative measurements in biology.
v.	Appreciate how biology concepts evolve with time, giving importance to its historical perspective.
vi.	Develop a scientific temper concerning biological phenomena (objectivity, critical thinking, creative skills, freedom from fear and prejudice) and Nurture natural curiosity, aesthetic sense, and creativity in biological processes and phenomena.
vii.	Imbibe the values of honesty, integrity, cooperation, concern for life and preservation of the environment.
viii.	Develop respect for human dignity and rights, equity and equality.

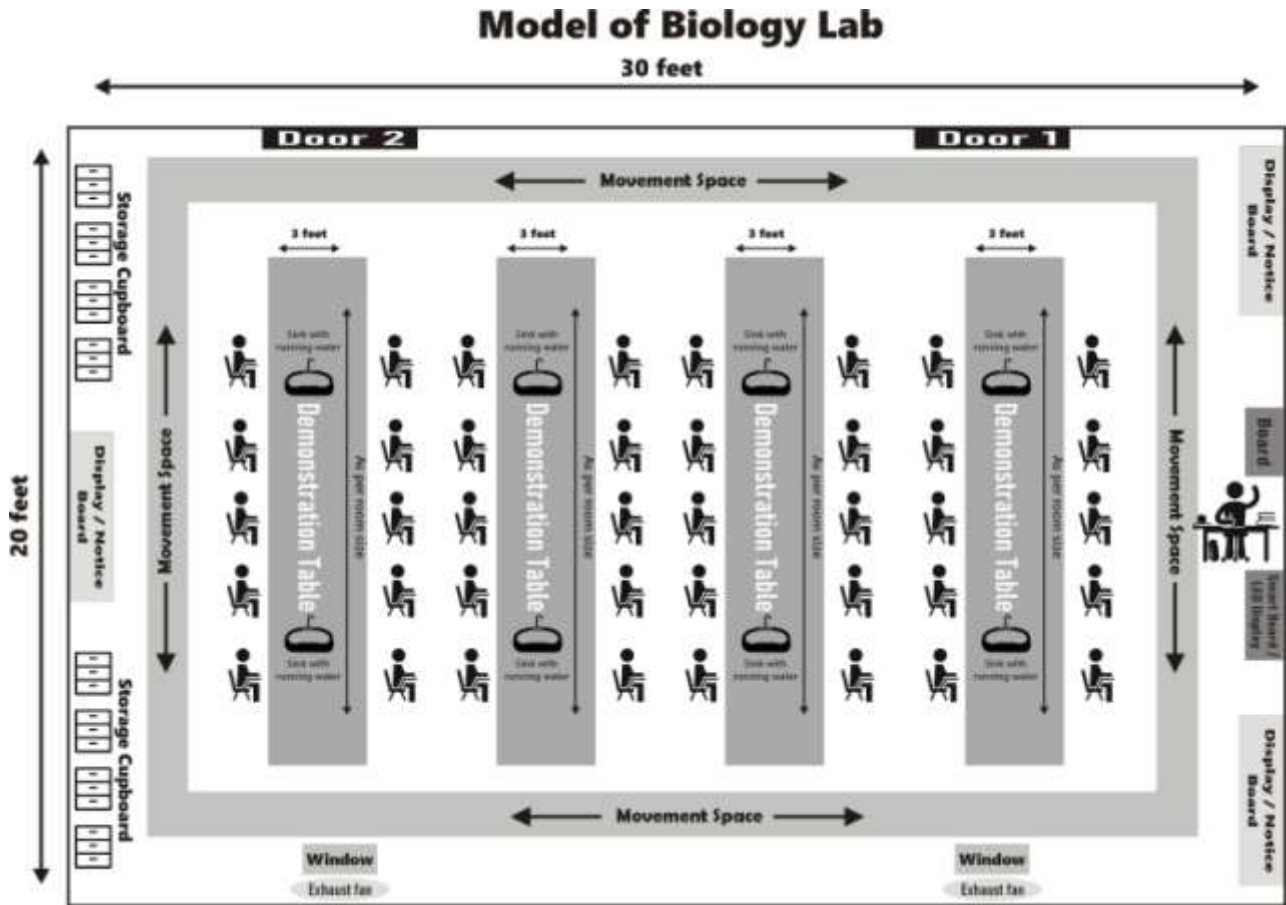
ix.	Connect biological concepts to real-life problems and develop innovative problem-solving abilities to solve problems related to life situations through an understanding of biological concepts.
x.	Widen skills to illustrate linkages of elementary aspects of biology with complex phenomena.
xi.	Integrate and interrelate biological concepts with other areas of knowledge by underlying common principles.

### **3. Pedagogy of Science education as recommended by National Education Policy 2020:**

- Chapter 4 of NEP 2020 ‘Curriculum and Pedagogy in Schools: Learning Should be Holistic, Integrated, Enjoyable, and Engaging’ has laid a wide emphasis on Experiential learning in all stages of science education in Para 4.6.
- Chapter 7 of NEP 2020 in Para 7.5 has mentioned the importance of well-equipped science laboratories for strong science education.
- According to Para 12.1 Effective learning requires a comprehensive approach that involves appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support. The curriculum must be interesting and relevant, and updated regularly to align with the latest knowledge requirements and to meet specified learning outcomes which can be made possible by well-equipped science laboratories.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Biology Laboratory in schools. The present SOP also illustrates adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempt to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

## 4. Model Layout of Biology Laboratory



## 5. Infrastructure needed for Biology Laboratory:

### Recommendations for Infrastructure

S. No.	Category / Materials needed	Requirements
1	Physical Infrastructure	<ul style="list-style-type: none"><li>• Minimum Lab. Room size 600 Sq.ft.</li></ul>
2	Storage	<ul style="list-style-type: none"><li>• A separate room or cupboards within lab for consumables and non- consumables items in the lock and key mechanism, thus ensuring a safety, dust and vermin-free environment.</li></ul>
3	Teaching facility	<ul style="list-style-type: none"><li>• Preferably an intelligent board with an internet Facility or white / green board.</li></ul>
4	Demonstration Table	<ul style="list-style-type: none"><li>• The demonstration table should also have a sink along with a water tap. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher.</li><li>• 40 seating facilities (lab stools)</li></ul>
5	Display / Notice Board	<ul style="list-style-type: none"><li>• Do's &amp; Don'ts/ rules for the laboratory use/ safety procedures</li><li>• List of practical activities</li><li>• Timetable- (laboratory timetable)</li><li>• Emergency Contact numbers</li></ul>
6	Gas/ heating	<ul style="list-style-type: none"><li>• Preferably gas pipeline. (2 heating burners)</li></ul>
7	Sink with Water supply	<ul style="list-style-type: none"><li>• 8 sinks with water supply</li></ul>
8	Waste management	<ul style="list-style-type: none"><li>• 02 bins to be installed for biodegradable and non - biodegradable waste.</li><li>• Flammable chemicals bottles must be packed separately. Empty chemical bottles can be packed in cartons/sacks. Disposal must be sent to the Material Management Division of the school.</li></ul>
9	Fire extinguisher	<ul style="list-style-type: none"><li>• To be installed at a prominent place within the laboratory or in the corridor outside the laboratory.</li></ul>
10	Exhaust fans	<ul style="list-style-type: none"><li>• 2 in number</li></ul>
11	Medical First Aid Kit	<ul style="list-style-type: none"><li>• 2 in number</li></ul>

## 6. Minimum requirement of equipment / items for a Biology laboratory

### a) List of Non-Consumable Items (for a batch of 40 students):

Sl. no	Non-Consumable	Requirement	Sl. no	Non-Consumable	Requirement
1	Beaker 100ml / 250ml /500ml	Twenty	25	Watch glass	Forty
2	Chart stand	one	26	Water bath	one
3	Conical flask	Twenty	27	Wash bottle	Twenty
4	Digital balance	Twenty	28	White cavity tiles	Forty
5	Dropping bottle	Twenty	29	Pipette stand	one
6	Forceps	Forty	30	All Pins	Four packets
7	Funnel	Forty	31	Burette (50ml)	Forty
8	Glass showcase	one	32	Burette 50 ml	Forty
9	Heater	one	33	Perforated beaker	250 ml - twenty
10	Hot plate	one	34	Capillary tube	Twenty
11	Human skeleton (Artificial)	one	35	Test tube holders	Forty
12	Leaf clamp apparatus	one	36	Tripod Stand	Forty
13	Measuring cylinder 50ml/100ml/250ml	Twenty	37	Thermometer	Forty
14	Micro viewers	Eight	38	Trough	Forty
15	Microscope compound	Eight	39	Wire gauge	Forty
16	Microscope dissecting	Eight	40	Burette Stand	Forty
17	Morter and pestle	Eight	41	Blade for section cutting	Eight
18	Petri dish	Forty	42	Chart display stand	Forty
19	Pipette (graduated 10ml)	Forty	43	Enamel Tray	Forty
20	Reagent bottle	Eight	44	Laboratory Coat	Forty
21	Skeleton (joints )	one set	45	Scissors 4"	Forty
22	Slide box	two	46	Scissors 6"	Forty
23	Test tube holders	Forty	47	Scalpel	Forty
24	Test tube stand	Forty	48	Staining Rack	Forty

**List of Non-Consumable Items (for a batch of 40 students):**

Sl. no	Non-Consumable	Requirement
49	Charts	<ul style="list-style-type: none"> <li>Controlled pollination, and Pedigree charts</li> <li>Roundworm, Earthworm, and Tapeworm</li> <li>Pigeon, Rat, Scoliosis, Starfish, Frog, and lizard camel, and Cockroach</li> <li>Mendels inheritance , and the life cycle of the mosquito</li> <li>Racemose Inflorescence, Cymose Inflorescence,</li> <li>Modifications of Roots and stem</li> <li>Posters / portraits of Scientists</li> </ul>
50	Models	<ul style="list-style-type: none"> <li>Claws and beaks, forelimbs modifications, Brain, Ear, and Eye</li> <li>Human Torso model, and Human Skeleton Model</li> <li>Root nodules of leguminous plants</li> <li>Cuscuta on host, lichens, homologous and analogous organs.</li> </ul>
51	Slide permanent	<ul style="list-style-type: none"> <li>Asexual reproduction, Plant tissues, Animal tissues</li> <li>Stages of mitosis, Meiosis, T.S. of the testis, T.S. of ovaries</li> <li>Pollen tube germination, T.S. Blastula</li> <li>Disease-causing agents, Bread mould, Amoeba, Hydra</li> </ul>
52	Specimens	<ul style="list-style-type: none"> <li>Only plant specimens which are in the syllabus are:</li> <li>Aquatic plants, xerophytic plants, monocot plants,</li> <li>Dicot plants, moss, liverworts, fern</li> <li>Stem root and leaf modifications,</li> <li>Plant diseases., mushroom</li> </ul>
53	Pictures / posters / Charts	<ul style="list-style-type: none"> <li>Ascaris, Entamoeba, Plasmodium, any fungus causing ringworm</li> <li>Bacteria, Oscillatoria, Spirogyra, Rhizopus, mushroom</li> <li>Yeast, liverwort, moss, fern, pine, one monocotyledonous plant</li> <li>One dicotyledonous plant and one lichen, Amoeba,</li> <li>Hydra, liver fluke, Ascaris, leech, earthworm, prawn</li> <li>Silkworm, honey Bbee, snail, starfish, shark</li> <li>Rohu, frog, lizard, pigeon and rabbit.</li> </ul>



**b) List of Consumable Items (for a batch of 40 students at any given time)**

S.no	Consumable products	Requirement	S.no	Consumable products	Requirement
1	Acetic acid	250ml	39	Hydrochloric acid	100 ml
2	Acetone	250 ml	40	Detergent	20 gms
3	Alcohol	500 ml	41	Iodine	100 ml
4	Aluminum Sulphate	20 g	42	Methylene blue	10 ml
5	Benedict's solution	100 ml	43	Micro cover slip	Eight
6	Muslin cloth	20 metres (50 cm per student)	44	Micro glass slides	Eight
7	Brushes	Forty	45	Million's reagent	100 ml
8	Matchbox	One box	46	Needle	Forty
9	Ammonium solution	250 ml	47	Nitric acid	50 ml
10	Acetocarmine powder	5 ml	48	Petroleum ether	100 ml
11	Cavity block	Forty	49	Potassium nitrate	20 g
12	Cavity slide	10	50	Safranin solution	50 ml
13	Cellotape / paper tape	one	51	Bile salts	Five gms
14	Chromatography paper	Two sheets	52	Soap	one
15	Cobalt chloride	50 g	53	Starch	50 g
16	Cork	10	54	Starch iodide paper	one packet
17	Cotton Roll	one roll	55	Sucrose	100 g
18	Dettol	100 ml	56	Test tube - Boiling	Twenty
19	Dropper	20	67	Test tube - Ordinary	Eight
20	Dusters	5	68	Test tube Graduated	Forty
21	Filter paper	Five boxes of 24 pieces each	69	Toothpicks	Five jars
22	Formaldehyde	500 ml	70	Aluminum foil	Four foils
23	Glycerine	500 ml	71	Barium Chloride	Five gms
24	Grease	100 g	72	Dicot stem	Ten
25	Boric acid	Five gms	73	Urea	Ten gms
26	Monocot stem	Ten	74	Milk	10 ml
27	Ethanol	50 ml	75	Seeds/Pulses	50 gm
28	Fehling solution A	20 ml	76	Rice	50 gm
29	Fehling solution B	20 ml	77	Spinach Leaves	50 gm
30	Glucose	20 gms	78	Potato	50 gm
31	Lens cleaning solution	one	79	Sugar	50 gm
32	Lens cleaning paper	one	80	Egg	one
33	Magnesium Sulphate	Ten gms	81	Onion root tips	50 gms
34	Onion root tips	Five root tips	82	Peas	500 gms
35	Plain stickers	Eight	83	Pineapple	50 ml
36	Robert solution	10 ml	84	Banana	one
37	Sodium Chloride	Ten gms	85	Apple	one
38	Sodium Hypobromide	10 ml	86	pH paper	one packet each of a narrow range and a broad range

## 7. Safety guidelines

In order to ensure the safety of students in Science Laboratories, the following provisions are mandatory:

### ➤ List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- It should be ensured that gas fittings in the biology laboratory fulfill the desired norms and standards.
- Periodical checking of electrical fittings/ insulations for replacement and repairs
- Timely and repeated instructions to students for carefully handling chemicals and equipment in the laboratory.
- Display of do's and don'ts in the laboratory at prominent places.
- Safe and secure storage of all chemicals and equipments.
- Proper labelling and upkeep of chemicals and equipments.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Careful supervision of students while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.
- Proper location of the laboratories.

### ➤ General work procedure for students

- When entering a laboratory, avoid touching equipment, chemicals, electrical and electronic devices, or other materials until you are instructed to do so.
- Follow all written and verbal instructions carefully given by the teacher/ instructor.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, breakage or injury, report to the teacher instantly: stay calm.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet/ socket.
- Never return unused equipment to their original container.
- Do not immerse hot glassware in cold water, as the glassware may break. Put the heated glassware in a different place to be cooled.
- Never look into a container that is being heated. Always observe containers from sideways.
- If the Bunsen burner goes out accidentally, immediately turn off the control device/ gas supply.
- Wash your hands with liquid soap and water on leaving the laboratory.

**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Mathematics Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## 1. Introduction:

Mathematics has to be learned by doing and not by rote memorization. This requires a suitable place for performing the activities. A well-equipped mathematics laboratory motivates the students and creates an environment to learn mathematics by doing. The need for a mathematics laboratory is mentioned in the *National Curriculum Framework for Elementary and Secondary Education (1988)* and has also been endorsed in the *National Curriculum Framework for School Education (2000)*.

A mathematics laboratory is an activity-centered approach to learning and a child is placed in a problem-solving situation through self-exploration and discovery. Some of the ways in which a mathematics laboratory can contribute to the learning of the subject are as follows:

- It provides an opportunity to understand and internalize basic mathematical concepts through concrete objects and situations.
- It enables the students to verify or discover several geometrical properties and facts using models or paper cutting and folding techniques.
- It enables the students to draw graphs and do analyses based on their calculations
- The laboratory provides an opportunity to exhibit the relatedness of mathematical concepts with everyday life.
- The laboratory promotes collaborative learning among students which further assimilates the concepts more effectively.
- It enables the teacher to demonstrate, explain and reinforce abstract mathematical concepts/ideas by using concrete objects, models, charts, graphs, pictures, posters, etc.
- It enables the students to verify various identities and formulae used in Algebra and
- Mensuration through activities, 3-d models of solid figures, and illustrative audio -visual aids.

## 2. Curricular Expectations:

The study of Mathematics is expected to fulfil the following curricular expectations:

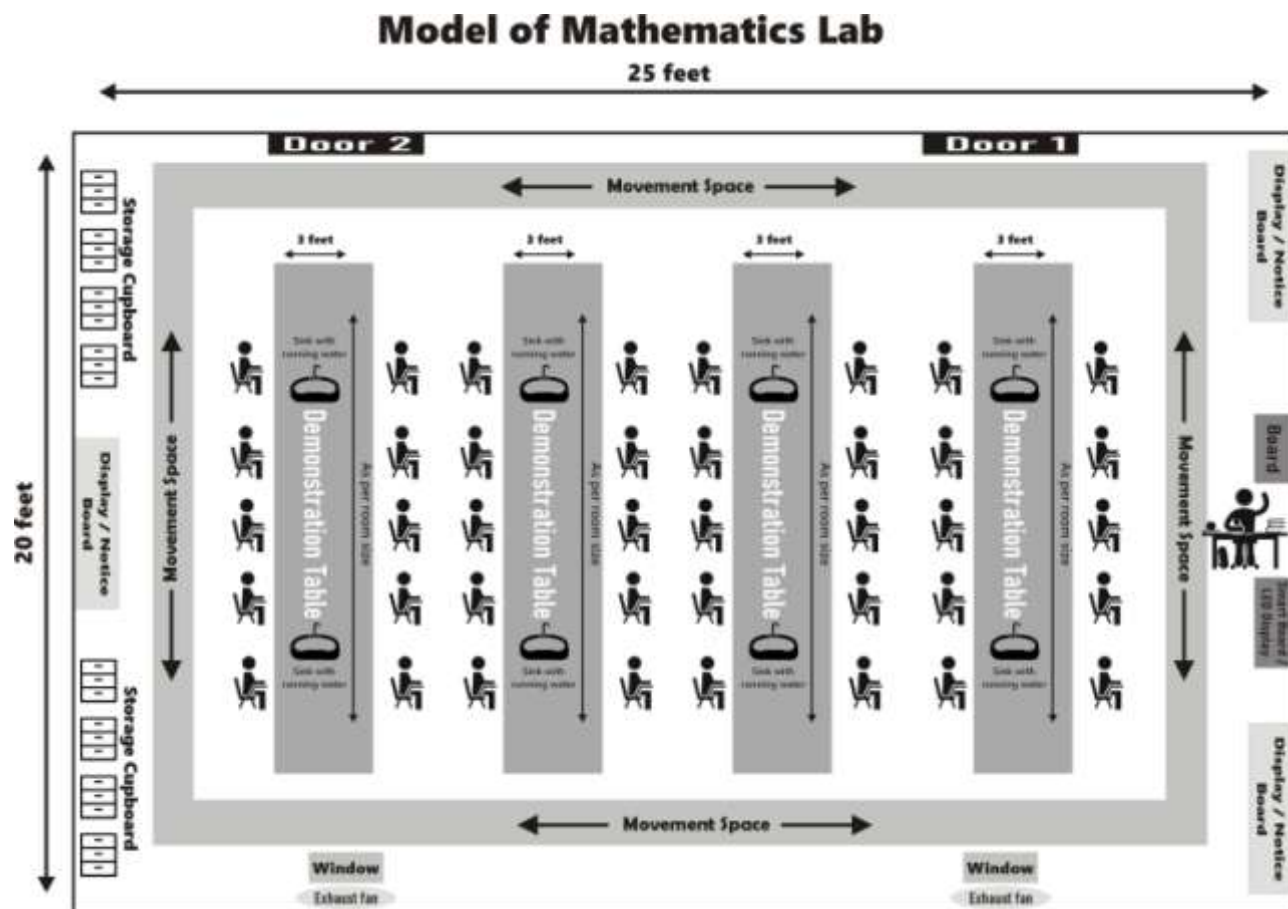
i.	To provide readily accessible rich manipulative materials to focus on “learning by doing”.
ii.	To develop an attitude of inquiry.
iii.	To remove the phobia of mathematics education and develop a positive attitude towards the subject.
iv.	To develop much-needed confidence in students.
v.	To generate interest in the subject.
vi.	To make the students divergent thinkers.
vii.	To provide individualized remedial instructions, and reinforcement of concepts through demonstration.
viii.	To emphasize conceptual understanding rather than rote memorization (NEP 2020).
ix.	To make learning Holistic, Integrated, Enjoyable, and Engaging (NEP 2020).

### 3. Pedagogy of Mathematics as recommended by National Education Policy 1986 and 2020

1. The National Policy on Education (NPE, 1986) stated that “Mathematics should be visualized as the vehicle to train a child to think, reason, analyze and to articulate logically”.
2. National Education Policy (NEP, 2020) recognized importance of mathematics and mathematical thinking in upcoming research-oriented fields such as artificial intelligence, machine learning and data science.

To align with the recommendations of NEP and for the convenience and clarity of all stakeholders, CBSE has prepared SOPs for laying down the requirements for Mathematics Laboratory in schools. The present SOP also illustrate adequately the safety rules for students and instructions for teachers in this regard. The SOP also attempt to sensitize schools about proper management of waste generated during the practical exercise carried out by the students. It is hoped that the SOPs will be helpful for schools and students in adopting basic rules for safe behaviour and hygiene, to avoid accidents in the laboratory.

### 4. Model Layout of Mathematics Lab



## 5. Infrastructure needed for Mathematics Laboratory:

### Recommendations for infrastructure and equipments:

S.NO	Category	Requirement
1	Physical Infrastructure	<ul style="list-style-type: none"> <li>Minimum Lab. Room Size 500 Sq.ft.</li> </ul>
2	Storage	<ul style="list-style-type: none"> <li>Display board</li> <li>blackboard (half plane &amp; halfgraph)</li> <li>Racks</li> <li>Almirah for storage</li> </ul>
3	Teaching facility	<ul style="list-style-type: none"> <li>Preferably an intelligent board with an internet Facility or white / green board.</li> </ul>
4	Demonstration Table	<ul style="list-style-type: none"> <li>There should be proper demonstration table. In the laboratory, seats are made available to the students, so students sit at the allotted place and note the instructions from the teacher.</li> <li>40 seating facilities (lab stools)</li> </ul>
5	Stencils	<ul style="list-style-type: none"> <li>For drawing mathematical shapes.</li> </ul>
6	Measuring tape 15 meters	2
7	Magnetic graph coordinate board with marker	1
8	Fraction concept instruments	1
9	Circle concept kit	1
10	Hardwood geometrical solids Hardwood geometrical solids	1
11	Volume relationship sets	1
12	Geometrical shapes 5x10 cm colored	12
13	Clinometer	2
14	Platonic solids and square prism and pyramids	1
15	Mensuration kits	1
16	Probability kit	1
17	Measuring jugs and beakers	1
18	Triangle kit	1
19	Standard time indicator	1
20	Scissors, one-meter wooden scale	2
21	Geometrical instruments comprising the compass, divider, scale set square & protractor.	1
22	Student Abacus (Wooden)	1
23	Standard Time Indicator	1
24	Physical Balance	1
25	Geo Board-Circle (Wooden)	1

24	Mathematical charts	<ul style="list-style-type: none"> <li>• Measurement scales, conic sections, Venn diagram, number system, time management, trigonometry</li> </ul>
25	Different types of papers	<ul style="list-style-type: none"> <li>• Isometric sheet</li> <li>• squared dotted sheet</li> <li>• graph paper etc.</li> </ul>
26	Pair of dice	<ul style="list-style-type: none"> <li>• Probability kit (Dice, playing cards, coins of different colours)</li> </ul>
27	Recreational games and puzzles	<ul style="list-style-type: none"> <li>• Tangrams, sudoku</li> <li>• Tambola</li> <li>• Integer board</li> </ul>
28	Unit cubes	1
29	Kit for primary classes 3 to 5	<ul style="list-style-type: none"> <li>• Fraction kit, Decimal kit</li> <li>• Fake money kit, Rangometry,</li> <li>• Training clock, Sau rang ki khoj</li> <li>• Tessellation kit, Dienes blocks (Rubber)</li> <li>• Maan cards four digit / six digit</li> <li>• Decimal maan cards</li> </ul>
30	Classes 6-8:	<ul style="list-style-type: none"> <li>• Probability kit</li> <li>• Fraction kit</li> <li>• Triangle kit</li> <li>• Integer board</li> </ul>
31	Classes 9-10	<ul style="list-style-type: none"> <li>• Probability kit</li> <li>• Mensuration kit</li> <li>• Measuring jug set. (7)</li> </ul>
32	Photo display of Indian Mathematicians	<ul style="list-style-type: none"> <li>• Famous Mathematician portraits/posters</li> </ul>
33	Models on Mathematics	Pythagorus theorem, $\pi$ diagram $(a+b)(a-b) = a^2-b^2$ $(a-b)^2=a^2+b^2-2ab$ $(a+b)^2=a^2+b^2+2ab$ Abacus and beads, Multipurpose mathematical kit etc.
34	Physical Balance & Electrical Balance	<ul style="list-style-type: none"> <li>• 1 each</li> </ul>
35	L.E.D.	<ul style="list-style-type: none"> <li>• Preferably roof mounted</li> </ul>
36	Geometry box	<ul style="list-style-type: none"> <li>• 05 for demo by teachers</li> </ul>
37	Thermometer	<ul style="list-style-type: none"> <li>• 1</li> </ul>
38	Sextant	<ul style="list-style-type: none"> <li>• 8</li> </ul>

## 6. Safety Guidelines:

### b) List of general SOP applicable at all times

- Two wide doors for unobstructed exits from the laboratory.
- An adequate number of fire extinguishers near laboratory.
- Periodically checking vulnerable points in the laboratory about the possibility of mishaps.
- Periodical checking of electrical fittings/ insulations for replacement and repairs
- Display of do's and don'ts in the laboratory at prominent places.
- Safe and secure storage of all equipment.
- Proper labelling and upkeep of equipment.
- Proper safety and protection provisions include a fume hood, goggles and gloves while doing practical work.
- Careful supervision of students while doing practical work.
- Advance precautionary arrangements to meet any emergencies.
- Conduct any additional experimental work only under supervision and with due advance permission.
- Availability of First Aid and basic medical facilities in the school.
- Proper location of the laboratories.

### c) General work procedure for students

- When entering a laboratory, avoid touching equipment, electrical and electronic devices, or other materials until you are instructed to do so.
- The students should be careful when doing electricity experiments.
- He/she should not touch any wires if his/her hands are wet, even for low voltage equipment.
- Follow all written and verbal instructions carefully given by the teacher/ instructor.
- Do not start any practical work unless you are clear about its directions. Ask your teacher before proceeding with the activity.
- Be cautious at all times in the laboratory. Call the teacher immediately if you notice any risky conditions.
- Never work alone in the laboratory. The presence of a teacher or supervisor is necessary.
- In case of spillage, breakage or injury, report to the teacher instantly: stay calm.
- When removing an electrical plug from its socket, switch off and grasp the plug, not the electrical cord. Hands must be dry when touching an electrical switch, plug or outlet/ socket.
- Wash your hands with liquid soap and water on leaving the laboratory.



**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Computer Science  
Laboratory**



**CENTRAL BOARD OF SECONDARY EDUCATION**

A computer laboratory is an expected infrastructure in all private and government schools. A computer laboratory is not just a cultivator of knowledge; it also promotes enthusiasm for technology, science, and research. It also allows children to not only learn emerging skills like coding and automation but will also allow them to see and explore careers in this upcoming field.

### 1. Pedagogy of the computer science education as recommended by the National Education Policy (2020)

- **Para 4.4 of the National Education Policy 2020-** The aim of education will not only be cognitive development, but also building character and creating holistic and well-rounded individuals equipped with the key 21st century skills
- **Para 4.41 of the NEP** focuses on teaching learning to be conducted in a more interactive manner where technological tools play an important role. Subjects such as artificial intelligence, Digital Citizenship, data science, computer science, and Information practices are incorporated throughout the CBSE curriculum which involves a lot of hands-on and online exploration.

#### □ **Inclusive Education:**

Assistive technologies, audio books, digital books, and other assistive tech-based solution should be provided to students with special needs.

#### □ **Teachers Training:**

Keeping in view the current trends in technology and its usage, it is imperative that the teachers are regularly trained. In service sessions, workshops, refresher trainings are done from time to time for all staff members.

Subject training on how to implement tech tools as an aid should also be organized.

### 2. Computer Lab Essential Infrastructure:

S. No	Category	Requirement
01	Physical Infrastructure	<ul style="list-style-type: none"> <li>• Minimum Lab. Room size is 600 Sq.ft.</li> <li>• Minimum 40 computer nodes.</li> <li>• Minimum 01 computer for 20 students (above 800 students)</li> <li>• Air Conditioner Facility</li> </ul>
02	Hardware Configuration for 20 Computers	<ul style="list-style-type: none"> <li>• Minimum i3 or above processor, 8GB Ram, 500GB Hard Drive, 15.6" Screen</li> <li>• UPS backup</li> </ul>

S. No	Category	Requirement
03	Equipment	<ul style="list-style-type: none"> <li>• Printer with Scanner (ADF)</li> <li>• Firewall security</li> <li>• Smart board with Projector</li> <li>• Speakers</li> <li>• Web-Cam</li> <li>• LAN</li> </ul>
04	Software Installation as per the requirement of the syllabus	<ul style="list-style-type: none"> <li>• Operating system</li> <li>• Office</li> <li>• Paint</li> <li>• Pivot Stick animator</li> <li>• Python 2.7 or above</li> <li>• Publisher</li> </ul>
05		<ul style="list-style-type: none"> <li>• Visual Basic 2015 or above</li> <li>• Adobe Flash</li> <li>• Net Beans</li> <li>• My SQL</li> <li>• Photo Scape</li> <li>• Online meeting software(s)</li> <li>• Antivirus</li> <li>• Open office software suite and googledocs/sheets</li> <li>• Programming: Scratch tool.</li> <li>• Flow chart: Google drawing</li> <li>• Virtual reality: Google art and culture</li> <li>• Augmented reality: NCERT ePathshaala AR</li> <li>• Use of inbuilt accessibility tools for CWSN</li> <li>• Drag and drop: Weebly, MIT App inventor</li> <li>• Blog writing: Word press</li> </ul>
06	Internet	<ul style="list-style-type: none"> <li>• Lease line minimum 20mbps 1:1</li> </ul>
07	Server	<ul style="list-style-type: none"> <li>• Minimum Core i5 CPU, 16 GB RAM, 2TB x 4storage</li> <li>• Server 2016/19</li> </ul>
08	Teaching Facility	<ul style="list-style-type: none"> <li>• Interactive White Board with projector</li> <li>• LMS (Learning Management System)</li> <li>• Speakers</li> </ul>

### **3. Rules for Computer laboratory:**

- Participating in behavior or activities that disturb other users or disrupt the operations of the lab is not permitted. Violations of the Computer laboratory rules will result in loss of computer privileges or other disciplinary action.
- Use the CD-ROM / Internet and other multimedia equipment for academic work only.
- Remember to “Log Off” at the end of each session.
- Antivirus scanning to be done on weekly basis

#### **a) Do's:**

- There should be a Software license compliance policy.
- Regular updates on machines to be checked and done by the Hardware Engineers.
- All the computers are connected to Centralized Data Center/Server.
- Annual stock verification is done by the laboratory attended.
- All the students are given laboratory facilities per the practical subjects allotted. The computers are available in a ratio of 1:2 (Students).
- The use of the computer lab regularly for their practical and assignments as part of their curriculum. Class and course-wise timetables and batches are prepared by the subject In-charge and the same is made available to all concerned staff such as course coordinators, and lab assistants.

#### **b) Don'ts :**

- Don't overburden the machines by storing the files or downloading them on local hard copies and the desktop.
- Don't surf the internet or e-mail without the supervision of a teacher/Lab attendant.
- Don't disturb others working in the Lab
- Don't install any software or modify or delete any system files on any lab computers.

**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Library**



**CENTRAL BOARD OF SECONDARY EDUCATION**

# **ESSENTIAL COMPONENTS OF SCHOOL LIBRARY**

## **1. LIBRARY SPACE**

**\*\* The size of Library Room should be minimum 1200 Sq.ft.**

A library should provide accommodation for at least 50 students of a class at a time, plus 10% extra space for other group activities, projects and reference service beside room for librarian, circulation counter, reference desk, books / periodicals display, committee/ conference room, property counter, catalogue enclosure.

## **2. LIBRARY FURNITURE:**

- (i) Chairs, Tables (size should be age appropriate)
- (ii) Book Stacks
- (iii) Periodicals display stand
- (iv) Newspapers display stand
- (v) Circulation Counter

## **3. LIBRARY COLLECTION**

Emphasis is to be given to develop library collection of classics, autobiographies, biographies, travelogues, essays, fiction, poetry, drama, recreational and motivational materials. Dictionaries, encyclopaedias, yearbooks, children's magazines, illustrations, maps and charts and other reference materials should be made available in the library. The minimum collection of documents should be as follows:

- (i) Minimum books : 1500
- (ii) Books: 5 books per child (Above 300 students)
- (iii) Magazines: 10 Magazines
- (iv) Newspapers 6 News Papers (2 newspaper each in English, Hindi and one of the regional language of the region)
- (v) Audio-Visuals
- (vi) Micro films
- (vii) Games and Models
- (viii) Maps, Atlas, Globes and Charts
- (ix) Machine Readable Formats
- (x) Pictures / portraits – Famous personalities

#### **4. INFORMATION COMMUNICATION TECHNOLOGY INFRASTRUCTURE**

- (i) Digital Display
- (ii) LCD Panel or Projector
- (iii) 01 Desktop with Internet Connection and Printing & Xerox facilities

#### **5. LIBRARY OPERATIONS:**

- Accession Register
- In house Operations: Automated System
- Circulation: Barcoded

#### **6. LIBRARY EVENTS:**

- (i) At least 6 Library events should be organized per annum
- (ii) Literary calendar of events should be prepared well in advance.
- (iii) To develop reading, writing and speaking skills, every student should be encouraged to read one book per week. The student will prepare one page summary which to be displayed on notice board every week. Book review and discussion also to be undertaken by librarian during library period in this regard.

#### **7. LIBRARY AUTOMATION (Optional)**

The term 'Library Automation' is being used extensively in library to mean use of computer application to perform the library activities such as acquisition, cataloguing, circulation, stock verification etc. Information Retrieval, automatic indexing & abstracting and networking are included in its preview. For better library services and management the school library should be automated at least with Barcode.

#### **AUTOMATION EQUIPMENTS**

The library should have circulation counter equipped with computer, printer and Barcode Scanner. Number of computers for OPAC and other digital materials access should be in the ratio of 5:1 where number of students for calculating number of computer is the maximum number of students attends the Library at the same time.

## **8. BOOK SELECTION / WEEDING / DISCARDING COMMITTEE: THE COMMITTEE SHOULD COMPRISE OF**

- (i) Librarian (Convener)
- (ii) Principal/ Vice Principal (Chairperson)
- (iii) Representatives from subject departments
- (iv) Head of the subject departments

## **9. LIBRARY POLICY**

The school library should have well documented library policy document. The Library Policy document should cover, Library Rule, weeding/discarding policy, collection development (digital and print both) policy, library class and other policy which needs to bring transparency in library operations and providing valuable services to the students and the teachers of school.

## **10. STAFF AND STAFFING:**

- (i) Librarian (TGT / PGT Grade) - One
- (ii) Assistant Librarian (PRT Grade) - One

## **> QUALIFICATIONS OF LIBRARY STAFF:**

### **(a) Librarian (TGT / PGT)**

- Masters Degree in Arts/Science/ Commerce + Degree or equivalent course in Library and Information Science from a recognised University

***OR***

- A Master's degree in Library & Information Science from a recognised University.

### **(b) Assistant Librarian (PRT)**

- Degree or diploma in Library & Information Science from a recognised University
-



**Essential Standard Operating Procedure  
(SOP) Required for Affiliation with CBSE  
Sports Facilities**



**CENTRAL BOARD OF SECONDARY EDUCATION**

## IMPORTANCE OF SPORTS IN SCHOOL EDUCATION

The sports in school education aren't just limited to physical activities as children today choose sports as their career and it has become equally essential as academic values.

1. **Enhances Health:** When children engage in sports, it enables them to build their muscle strength, reduce fat, burn cholesterol, increases height, lung capacity, and prevent the body from obesity, or problems like high blood pressure or diabetes. Sports education has greatly emphasized that physical activities are not just about being healthy but fitness should become a lifestyle.
2. **Enhances Character:** Playing sports develops a child's character to become confident and adaptable. It also instills patience, self-discipline, perseverance, to accept the beauty of defeat and improving their skills, teamwork, and lifelong healthy habits of fitness which they will carry till adulthood.
3. **Enhances Leadership:** Becoming captain or aspiring to become one, naturally teaches children how to become good leaders – how to talk to other teammates, manage team emotions, taking crucial decisions, etc. These leadership experiences will be critical to working their way up as adults for shaping their career.
4. **Enhances Academic Performance:** It helps to strengthen their belief system and confidence, which results in improved academic performance. Participation in sports has proven to increase cognitive and memory functions of the brain, helping kids perform better in academics. The power of focus, discipline, or perseverance that comes from playing sports also enables the child to thrive well in academics.
5. **Enhances Social Life:** Physical stimulation releases beta-endorphins, and also the levels of serotonin in the central nervous system causing an increase in appetite, and the feeling of well-being that reduces stress and accentuates the feeling of happiness. When a child is happy and healthy it reflects in their social interactions with others. The improvement in energy levels that come from playing sports enable children to be active, jovial and playing in teams makes them develop a sense of belongingness and an opportunity to make new friends. These communication and social skills in turn help them in their future relationships and careers.

**National Education Policy (NEP) 2020** gives special attention to sports-integrated learning for students to adopt fitness as a lifelong attitude as envisaged in the Fit India Movement.

## **Sports Infrastructure**

Every school should have adequate or latest sports infrastructure/ facilities both indoor and outdoor as per following:

**1) Sports Field with Track** (Minimum 200m Track)      Synthetic/ cinder/ grassy

### **2) Outdoor Games (Minimum two)**

- |                  |   |
|------------------|---|
| 1. Basketball    | Synthetic/ cemented                                   |
| 2. Kho-Kho       | Synthetic/ grassy                                     |
| 3. Volleyball    | Synthetic/ wooden / grassy                            |
| 4. Handball      | Grassy/ Synthetic                                     |
| 5. Lawn Tennis   | Synthetic/ clay court                                 |
| 6. Skating       | Cemented  |
| 7. Football      | Synthetic/ artificial turf / grassy                   |
| 8. Hockey        | Synthetic/ artificial turf/ grassy                    |
| 9. Swimming pool | 50m (standard)/ 25m as per budget/ space availability |
| 10.Badminton     | Synthetic/ cemented                                   |
| 11.Kabbadi       | Grassy/ Synthetic                                     |

### **3) Indoor Games (Minimum three)**

1. Basketball
2. Badminton
3. Chess
4. Judo
5. Taekwondo
6. Yoga
7. Aerobics
8. Rope skipping
9. Archery
- 10.Rifle shooting
- 11.Swimming pool
- 12.Kabbadi
- 13.Boxing
- 14.Table Tennis
- 15.Gymnastics

## Equipment's

1. The school should have certain essential and protective equipment's / safety gear according to the nature of sports/game.
2. Athletics - Relay Batons, hurdle, Discus, Javelin, shot put, etc.
3. Basketball - Balls should be arranged in different sizes according to the age group of students and according to the norms and rules of NSF.
4. Table tennis - Standard size tables and other equipments.
5. Football, Volleyball and Handball size, weight and circumference of the ball should be according to the age group of the students according to the norms prescribed by the concerned National Sports Federation (NSF).
6. Judo, Taekwondo, Gymnastics, Yoga & Kabaddi mats should be according to the norms of NSF.
7. Badminton, Tennis racquets and shuttles should be according to the norms of NSF.

## Staff

1. Dedicated Technical Sports staff having aptitude to perform both on and off field is obligatory on the part of school.
2. **Primary / Middle Classes - 01 Physical Education Teacher** having minimum qualification as B.P.Ed. or as per NCTE notification as following:-

(a) Senior Secondary (Class XII or its equivalent) with at least 50% marks from recognized Board.

**Or**

Candidates who have passed the Senior Secondary examination (+2) or its equivalent and have participated in sports/games at least school/college/district level in accordance with and National Council for Teacher Education (Recognition Norms and Procedure) Regulations, 2007 notified on 10.12.2007

**Or**

Senior Secondary (Class XII or its equivalent) with at least 45% marks from recognized board {in accordance with the National Council for Teacher Education (Form of application for recognition, the time limit of submission of application, determination of norms and standards for recognition of teacher education programmes and permission to start new course or training) Regulations, 2002 notified on 13.11.2002

**And**

- (b) Certificate/Diploma in Physical Education of duration not less than two years (or its equivalent) from any National Council for Teacher Education recognized institution

3. **Secondary / Senior Secondary Classes - 01 Primary Sports Teacher (PET) and 01 Senior Sports Teacher** having minimum qualification as Masters in Physical Education (M.P.Ed. or MPE or any other equivalent qualification as prescribed by AICTE or NCTE for Physical Education) or as per NCTE notification as following:-

Bachelor of Physical Education (B.P.Ed.) or Bachelor of Physical Education (BPE) or Bachelor of Science (B.Sc) in Health and Physical Education and Degree in Sports with at least 55% marks as per National Council for Teacher Education (Recognition Norms and Procedure) Regulations, 2009

**Or**

At least 50% marks in the B.P.Ed. degree / B.P.Ed. (Integrated) 4 years professional degree in accordance with the and National Council for Teacher Education (Recognition Norms and Procedure) Regulations, 2007 notified on 10.12.2007

**Or**

B.P.Ed. with atleast 55% marks or B.P.E. Course (or its equivalent) of 3 years duration with at least 50% marks in accordance with the National Council for Teacher Education (Form of application for recognition, the time limit of submission of application, determination of norms and standards for recognition of teacher education programmes and permission to start new course or training) Regulations, 2002 notified on 13.11.2002

**And**

M.P.Ed. of at least 2 years duration from any National Council for Teacher Education recognized institution.

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