A Handbook on Mainstreaming Education for Students with Blindness and Low Vision

by
The Xavier's Resource Centre for the Visually Challenged (XRCVC)

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ABOUT THIS HANDBOOK

The Right to Education Act (RTE), 2009 has taken a significant step forward in recognising that education cannot be denied to any child in India. This includes students with disabilities. Education philosophies the world over have transitioned from 'special' to 'inclusive', under which children with disabilities study in the same class as other children. It has been observed that this not only adds value to their learning but significantly uplifts the learning of their non-disabled classmates and friends.

Oftentimes, we experience situations where parents of blind and low vision students approach us with doubts about what set-up is better; whether mainstream schools will accept their child; and if such schools will know how to educate them. On the other hand, school teachers and administrators share their hesitations and apprehensions on working with a blind child in the school; presuming that the skills required to work with blind and low vision students will be beyond their grasp.

This handbook aims at helping educationists to better understand how they can effectively include blind and low vision students in their regular classrooms, while also providing information on the legal framework for inclusive education.

It also attempts to address some key questions related to the education of the blind and low vision. It is divided into an introduction to inclusive education, understanding the physical condition, a practical guide on considerations while teaching blind and low vision students and additional areas of inclusion.

Although we have tried to provide a comprehensive understanding and know-how on educating the blind and low vision, we may have not captured every area there is to this. Even so, we hope this guide gives you something to start with when opening the doors of education to the blind and low vision.

For any other support you may need, feel free to contact us.

Dr. Sam Taraporevala
Director, XRCVC

ABOUT XRCVC

The Xavier's Resource Centre for the Visually Challenged (XRCVC) is a state-of-the-art support and advocacy centre for persons with blindness and low vision. It is a department of St. Xavier's College, Mumbai, India, and works actively in the areas of providing Direct Support and Training Services to blind and low vision persons, Awareness Generation and Advocacy Initiatives.

The XRCVC works actively towards creating an inclusive environment both at the micro and the macro levels. Some of the key areas of its advocacy initiatives lie in the field of Print Access, Financial Access, Education Access and Independent Living.

Research & Editorial Team

Dr. Sam Taraporevala
Director, XRCVC;
Associate Prof., & Head, Department of Sociology,
St. Xavier's College

Ms. Neha Trivedi
Project Consultant, XRCVC

Ms. Calveena D'Sylva
Special Educator, XRCVC

Ms. Rebecca Carvalho
Consultant (Math & Science Access Project), XRCVC

Mr. Krishna Warrier
Consultant (Project Implementation), XRCVC

Production Assistant

Ms. Joyna Michyari
TYBMM, St. Xavier's College

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1. INTRODUCTION

1.1 Concept of Education

Education philosophies have long debated the meaning of education, learning and associated experiences. A new-born child starts learning from its first moment. Learning is not only a survival skill inherent in all human beings but also an instinctive nature for the human spirit to flourish and grow.

Whilst all social agencies contribute to an individual's learning through life, a dominant area that has come to be principally in charge of learning in the space of formal education has been schools, colleges and associated learning organisations.

1.2 Concept of Inclusive Education - Legal and Logical Rationale

Whilst there is an endless variety in learners, as there is in teaching skills, learning is fundamental to all human beings throughout one's life. However, what happens when persons with disabilities seek the same fundamental urge to learn?

Though the desire to learn amongst students with disabilities is as high as their non-disabled counterparts, formal educational institutions have often been reluctant to quench their thirst for learning.

Legally, the Persons with Disabilities (PwD) Act, 1995,as also the Right to Education Act, 2009 both ratify the right of every child with a disability to have access to education in mainstream institutions on par with the disabled. Internationally, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD),

2008, under its Article 24 on Education, clearly states that:

"1. States Parties recognize the right of persons with disabilities to education. With a view to realizing this right without discrimination and on the basis of equal opportunity, States Parties shall ensure an inclusive education system at all levels and lifelong learning directed to:
(a) The full development of human potential and sense of dignity and self-worth, and the strengthening of respect for human rights, fundamental freedoms and human diversity;
(b) The development by persons with disabilities of their personality, talents and creativity, as well as their mental and physical abilities, to their fullest potential;
© Enabling persons with disabilities to participate effectively in a free society."

As a country that has ratified the convention, India is obligated to ensure the implementation of its rules. Amongst the many aspects of the right to education, the convention is specific in stating:

"2. In realizing this right, States Parties shall ensure that:
(a) Persons with disabilities are not excluded from the general education system on the basis of disability, and that children with disabilities are not excluded from free and compulsory primary education, or from secondary education, on the basis of disability;
(b) Persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live;
(c) Reasonable accommodation of the individual's requirements is provided;
(d) Persons with disabilities receive the support required, within the general education system, to facilitate their effective education;
(e) Effective individualised support measures are provided in environments that maximise academic and social development, consistent with the goal of full inclusion."

environments that maximise academic and social development, consistent with the goal of full inclusion."

Given the above, not including students with disabilities in an education institution is a violation of existing legislations in the country and international conventions which India is obligated under.

Besides the legal fact, it is not always practical or logical to expect blind students to attend special schools; after attending such special schools, there is no special college, special workplace, special family, country or world for these students. Simply put, the 'special' road leads to exclusion. It is not only undesirable but also not feasible. We often feel the need for special schools because we believe their world is 'very different'. Persons with blindness and low vision live in the same world; they only access it differently.

Moreover, what is often the ignored story of inclusive education is that it not only benefits the students with disabilities but it greatly benefits the teacher, the classmates and the educational institution itself.

Some areas where blind and low vision students bring positive change in the classroom are as follows -

- Incorporating principle teaching methods of reaching out to students with disabilities makes the class more enriching for all.
- It makes the teacher improve her communication and explanatory skills.
- Bringing in diverse real objects, 3D models and other teaching-learning aids to the classroom enhances the learning process.
- Some of the fundamental values of education are empathy, communication and respecting differences. By having a diverse student base, and students with disabilities, classmates learn the important values of education first-hand and rapidly. It helps shape individuals with an open mind-set.

- Educational institutions that can truly fulfil their roles of inclusive education through their philosophy are able to impart a higher quality of education and create a work and educational culture that positively impacts its students and communities. It is what will make the institution stand out as a true educational institute rather than a mere teaching factory.

The laws in India today, as also international treaties that India is obligated by, recognise the need for inclusion and demand that every educational institution be able to meet the learning needs of students with disabilities, but are the schools ready?

1.3 Current Ground Reality of Inclusive Education

Historically, the lack of information and resources often resulted in the idea that students with blindness and low vision required 'special' care. The history of special schooling came from the 'medical model of disability' which recognised disability to be a lack of function in the person with disability that needed to be 'rectified' by the person themselves with extra care from special institutions. This medical view of disability has long since shifted to the 'social model of disability' which recognises the role of the environment and social systems in creating disability of physical conditions; and the need for the social systems to cater to needs of diverse users.

What began as integrated schooling, where students with disabilities were permitted to come to mainstream schools with the student still being responsible for their learning, has now transitioned into inclusive schooling where educational institutions are mandated to provide equal learning opportunities to all learners including students with disabilities.

Educational institutions, internationally as well as in India, have already started making this effort. In Mumbai today, there are over 70 mainstream schools that have students with disabilities enrolled with them.

What is needed however is the need to increase the scale and quality at which inclusive education is available in India currently.

The ground reality remains that an average student with disability especially at the schooling level before reaching one of those 70+ schools who are abiding by the Right to Education laws of the country, come across at least 5 others who refuse admission either directly or courteously.

What needs to change is that the 'struggle' of education for a person with blindness and low vision becomes a pleasurable learning experience both for the student and the institution.

2. BLINDNESS AND LOW VISION

2.1 Introduction to Blindness and Low Vision – The Physical Condition

Blindness is purely a physical condition; students with blindness and low vision do not have a comprehension difficulty. If material and instructions are presented to them in accessible formats (audio/tactile), comprehension is not challenged.

No two children in a class are the same, and the disability difference need not be feared. Depending on the eye condition, one can have either of the following students:
Totally blind - does not see at all
Blind, but can see light and overall form
Low vision - sees partially; degree of vision varies for each person

2.2 Myth, 'n Fact

Before beginning to teach blind and low vision students, it is necessary to get the possible doubts and fears cleared, and understand the disability.

MYTH:
"All who are blind and low vision see nothing at all. They are always in total darkness."
FACT:
While some blind and low vision persons 'see' total darkness, a majority of people who are considered blind have some sight, rather than no sight at all. That is, they have some residual vision, whether it is light perception, colour perception, or form perception. Depending on the eye condition, students may not see at all, see partially, have only light perception, only form perception.

MYTH:
"People who are colour-blind see only in black and white."
FACT:
Persons who are colour-blind may perceive colours less vividly than the normal seeing person, or may see only in black and white.

MYTH:
"All people who are blind and low vision wear dark glasses."
FACT:
The need for any type of low vision aid (glasses, magnifiers, etc.) is dependent upon the eye condition, the existing situation and the preference of the person who is blind or visually impaired.

MYTH:
"A low vision student's vision will wear out if used too much. Hence, he should give up reading and writing."
FACT:
This is not necessarily true for all eye conditions. It is generally good to make use of residual vision. This decision should only be made on the doctor's recommendations.

MYTH:
"People who are blind and low vision cannot read printed or handwritten materials."
FACT:
The advent of computers and other technology has made nearly any kind of print accessible to people who are blind and low vision. Computer software can magnify images on the screen, enlarge text to a readable size, translate print into speech etc. Occasionally, human readers take care of the rest.

MYTH:
"All blind people are the same; hence, I use the same teaching methods that I used with my previous blind student for all future blind and low vision students as well."
FACT:
Just as it is erroneous to state that people of a particular caste, creed, race, gender etc. are similar; likewise one cannot assert that persons with blindness and low vision are the same. The most crucial idea to remember on the road to inclusion is no two students will be the same. Your experience will differ between two blind or low vision students just the way that it varies between two sighted students.
Hence, there is no best or single formula for teaching students with blindness. With the key principles in mind, educators must let their teaching experience guide them through the journey. Also, a person may be anywhere on the spectrum of conditions that exists – from total blindness to functional low vision.

In case the previous student had low vision, he may have been able to manage with the use of large font. However, if the student who is expected in the following year happens to be totally blind, the same method will be impractical.

MYTH:
"Blind and low vision people are very good people."

FACT:
Blindness is a physical condition which has nothing to do with their sense of values and morality, or even personalities. Similar to sighted individuals, blind and low vision persons may be either good or bad or cunning or shy or gentle or courteous and so on.

MYTH:
"Individuals who are blind have a sixth sense, 'super' hearing and extraordinary talents."

FACT:
There is no God-gifted sixth sense but trained senses & learned abilities. With practice, students with blindness and low vision may develop a sharper sense of touch, hearing, taste, or smell. This is possible only through experience, and varies greatly between individuals.
Usually a combination of hard work and the development of a good memory will permit people experiencing a vision loss to function very well. To compensate for their loss of vision or lack of functional vision, many learn to listen more carefully, or remember without taking notes.

MYTH:
"I must speak and read slowly and loudly to him so he can grasp correctly. "

FACT:
Speak in your usual conversational voice. As a common courtesy,

make eye contact when speaking, just as you would with a sighted person. Many learn to listen more carefully. Plus, they do not have any comprehension concerns. Read at the pace and volume the person is comfortable with. You can check with them for speed and volume.

As a teacher,

- face the class when speaking.
- speak clearly in a normal voice, not loudly, slowly or with exaggeration. If in doubt ask the student if the pace is alright.
- keep hands away from your mouth when speaking.

MYTH:

"Blind and low vision persons have special cognition. They are very intelligent and will outperform others."

OR "They are not clever, less informed."

FACT:

Blindness is a physical condition. With proper training and opportunity, the average blind or low vision person can compete in terms of equality with the average person who is sighted.

MYTH:

"They need constant help. Persons who are blind and low vision are helpless and require supervision in their daily activities for their safety."

"I will have to help him all the time; and hence, I will not be able to keep an eye on other students."

OR

"Students who are blind or visually impaired need more supervision than others."

FACT:

Blind and low vision persons are, by and large, more independent than others give them credit for. Many are mobile and independent. Many view their blindness as a mere physical condition and not a disability.

No student likes constant attention. A student with blindness and low vision seeks as much independent time as their sighted peers. Besides, constant help will only inculcate dependency rather than independence.

MYTH:
"It is too risky to have blind and low vision students move around alone in school. If he injures himself then the school will be held liable. It is best that we don't admit him. Or if we absolutely have to open the door to them because of the new laws, then the family must provide a caretaker with the student all the time."

FACT:
Does the school not admit any student because children are prone to falling more than adults? Students with blindness and low vision have their own tactile and auditory mobility techniques. If the school is concerned, it could rather make efforts to create a secure environment which will be safe for everyone. Blind students of Mumbai move around on the roads and potholed pavements, the school infrastructure will surely not be as unsafe!

MYTH:
"I must not scold him."
OR
"I must be lenient with the student in class and while grading. He is working so hard anyway."

FACT:
If you believe in not scolding anyone, you must not scold them either. However, if you do not scold only them, it would be moving away from equality. Inclusion is only achieved when there is impartiality. Being lenient for the sake of disability is the biggest form of exclusion, and will lead to lasting damage. A student with blindness or low vision requires the same discipline and behaviour expectations as other students. Grading, too, should be on par with the non-disabled.

MYTH:
"Those who are blind or visually impaired shouldn't participate in physical activities for fear of losing their remaining sight."
OR
"Students with blindness and low vision can't participate in games, physical education, yoga etc. because they can't see what they are doing."
FACT:
The physical limitations of an individual ought to be determined by a medical examiner. Nevertheless, exercise and recreational activities should be encouraged for everyone. Activities improve motor skills, coordination, and visual and auditory perceptual skills. Most physical activity can be easily adapted to allow blind and low vision persons to join their sighted counterparts.

MYTH:
"Blind or low vision persons can't do most jobs."
FACT:
Blind or low vision persons are currently doing many jobs, some which may astound you, like software developers, educationists, lawyers, painters.

MYTH:
"Parents will know the answers to all my questions. It is their child, so I can check with them for doubts."
FACT:
Teachers should remember that parents are a part of the same society as they are. Like the rest of the public, they do not necessarily have any prior knowledge or experience with blindness or low vision. Moreover, sometimes parents have their own emotional concerns and tend to either over protect or over push the child.

2.3 Interacting with the Blind and Low Vision

Interact with blind and low vision students as you would with sighted students. As with any disability, the best approach is to interact with the person, and not with their disability. But when interacting with them keep in mind that a blind or low vision person is not seeing actions, facial expressions, visual information on signboards etc.

Here are some situational examples.

- While assisting a blind or low vision person, avoid grabbing his arm; offer your arm instead. The sighted guide technique is the universal manner acceptable while escorting blind and low vision persons. This requires the person who can see i.e. the sighted guide to offer his upper arm to the blind or low vision person such that that person stands just about half a step behind, and holds the guide's left elbow with his right hand or right elbow with his left hand. This ensures that every turn and every step is more easily identifiable. In the case of young students, for whom holding an adult's upper arm is not practical, they may be taught to hold on to the wrist of the adult sighted guide.

Situation 1:
The sighted person holds the blind or low vision person ahead to keep an eye on him while walking. - IMPROPER
The sighted person stands beside and slightly in front of the blind or low vision person, offers his upper arm and walks ahead to show the way. - APPROPRIATE

- When asked for help, do not interfere with a blind or low vision person's cane. Know that the white cane gives them grounding, so to speak. It allows them to know where they are

stepping, and provides orientation. Hence, it is imperative that you do not try to assist a blind or low vision person by lifting or shifting their cane.

Situation 2:
The sighted person lifts the cane off the ground and begins walking while the blind or low vision person follows based on the direction of the cane. - IMPROPER
The sighted person asks the blind or low vision person if he would like to use the sighted guide technique or simply walk alongside. If the sighted guide technique is preferred, then based on whichever hand the person is holding the cane in, the sighted individual stands on the opposite side to make use of the sighted guide technique while the blind or low vision person still has the liberty to use the cane on the ground. - APPROPRIATE

- Do not expect blind and low vision persons to recognise your voice. Indicate verbally when you are entering or leaving a blind or low vision person's presence, or while ending a conversation. If you are in a room, and a blind or low vision person enters, identify yourself.

Situation 3:
"Hello! Do you know who I am?" - IMPROPER
"Hello everyone. I am Miss Anita here for the History class." - APPROPRIATE

- Do not contemplate changing the syntax of a language so as not to offend a person by using regular words. Do not be afraid to use the words like 'look', 'see', 'blind' etc., as these are normal. Their eyes may not work but it is still "Nice to see you." Phrases like "See you tomorrow." are perfectly alright because here, 'seeing' refers to 'meeting'.

like “See you tomorrow.” are perfectly alright because here, ‘seeing’ refers to ‘meeting’.

Situation 4:
“Did you listen to TV last night?” - IMPROPER
“Did you watch TV last night?” - APPROPRIATE

- When giving directions, be specific and avoid visual cues (like hand gestures).

Situation 5:
“Turn left after the red door.” - IMPROPER
“Take the second left from here.” - APPROPRIATE

- In the classroom, read aloud while writing or drawing on the board. Be as explicit as possible while you verbalize everything that is on the board, overhead projector, chart etc.

Situation 6:
“Let's look at this sentence.” - VAGUE
“Let's look at sentence number 5.” - SPECIFIC

Situation 7:
“How much have I circled on the board?” - VAGUE
“I have circled 1 rupee and 50 paise on the board; how much is that?” - SPECIFIC

- Announce the end of an activity.

Situation 8:
Only closing the book and placing it on the table after the lesson is over - IMPROPER
Saying, “The lesson is over and we have finished for today” - SPECIFIC

- Verbalize your response or reaction and body language where required.

Situation 9:
Nodding or shaking your head in reply. - IMPROPER
Saying, “Yes” or “No”. - SPECIFIC

- In the classroom, use of only non-verbal cues like pointing is not noticeable. Your communication needs to be combined with a tactile or audio supplement. Pointing and saying ‘this’, ‘that’, ‘there’ etc. would be confusing. However, the use of precise words such as ‘straight ahead’, ‘turn left’, ‘on your right’ would make sense to the student.

Situation 10:
#“The desk is over there.” - VAGUE
“The desk is about five feet to your right.” - SPECIFIC

Situation 11:
“Go over there.” - VAGUE
“Go and stand near the window on your left.” - SPECIFIC

- Similarly, in the classroom, if you only point out to blind and low vision students when you want them to answer questions, they will not follow. Instead, call out the name of each student that you refer to. This helps to let them know who you are speaking to; and helps them focus their attention on what is happening in the classroom, thus keeping him in the loop.

Situation 12:
Extending your hand and saying “Yes, speak.” - VAGUE
Touching the student on the arm and/or addressing him by name, “Ravi, give the answer.” - SPECIFIC

- In the classroom, when checking if blind and low vision students can see specific visual material, teachers could try out open-ended questions that allow the student to freely express themselves. This would allow the teacher to gauge the student's concentration and comprehension levels.

Situation 13:
"Can you see this?" - IMPROPER
"Tell me what you notice." - APPROPRIATE

- When providing a student with a real object or its corresponding 3D model or 2D representation, ensure that the orientation is right from his perspective.

Situation 14:
When handing over a flower, the petals are facing the ground or floor. - INCORRECT
When handing over a flower, the petals are facing upwards towards the sky or ceiling. - ACCURATE

- When in doubt, ask.

More often than not, individuals with blindness and low vision would be willing to clarify how much they can or cannot see, or ask you for help. In the case of young children, you may get to know about the condition from the parents or caregivers.
If you are not sure whether you should or shouldn't assist blind and low vision persons at a particular task, ask. No self-respecting individual appreciates assistance at all times. Ask the student's permission before giving physical assistance.

Ensure that other teachers, assistants, students etc. are familiar with the sighted guide technique.

Remind the sighted students and staff to identify themselves by name when addressing the student, and basically, follow the all the above suggestions. A support organisation may be contacted to conduct sensitisation programmes for the staff and students, if required.

3. TEACHING BLIND AND LOW VISION STUDENTS

3.1 Basic Teaching Techniques

Teaching the blind and low vision is no rocket science. A lot of principles used in teaching methods for the sighted can be used with blind and low vision students as well. Additionally, here are a few ideas which should be considered when planning a lesson in an inclusive classroom.

Concrete Experiences

Sighted children receive a lot of information from their surroundings outside any formal curriculum in no particular structure or format but just by the visual exposure they get. A blind and low vision child lacks such incidental learning.
For example, if a blind and low vision child is not exposed to or tactually shown things as common as a leaf, a tree, a plant etc., he may grow up without ever having a clear concept of these words, and maybe without ever experiencing them.

Also watch for situations for which the student may have had no prior experience.
For example,
- Foods in different forms: corn-on-the cob, cooked corn, popcorn, dried corn;
- Matter in altered form: water, steam, ice, dew;
- Occupations: the different jobs people perform; etc.

Considering that there may be no incidental learning for a blind and low vision child, concrete experiences need to be provided when teaching all academic and non-academic subjects, even for seemingly obvious everyday things.

Without such opportunities, associating words with elements of the environment is difficult. Thus, it is important that such associations be supplemented with input from other senses and through alternative activities.

Sensory Substitution & Multisensory Approach

Teaching materials and methods must be planned such that they encourage the use of the remaining senses to substitute blindness and low vision.
-If it can be done or experienced, make the students do it. Use the kinesthetic sense.
-If it can be touched, encourage tactual exploration. Use the sense of touch.
-Encourage the use of smell and taste while exploring, wherever possible.

There may be concepts which seem entirely visual, but which also involve other senses.
For example, a shadow is not only darker but also cooler; this could be brought to the student's attention.

Hence, if a concept can be experienced by more than one sense, this should be encouraged. Make it a point not to focus only on one particular sense (especially auditory) when teaching the blind.

A variety of activities should be planned to provide a multisensory approach. Even in the case of those with low vision, alternate visual tasks with non-visual tasks to avoid eye fatigue.

Real Objects > 3D Models > 2D Representations

Real objects, activities and various exercises should be planned to depict new words and concepts. However, while choosing teaching-learning aids and activities for blind and low vision students, give first preference to real objects or experiences, followed by 3D models and then 2D representations.

Interaction with a model or an image is not the same as dealing with a real object, particularly if the student has not previously had direct contact and interaction with the real item. This is true for all students, but especially for blind and low vision students. For example,
- Playing with a plastic 3D model of a dog has no meaning to the student who has not touched, heard, smelled and interacted with a real dog.
- Showing an artificial apple to the student who has not touched, smelled and tasted a real apple will leave the concept of an apple incomplete. Further, a blind and low vision student, who eats a cut apple in his lunch box daily, may never actually have come across a whole apple and hence, will not be able to associate the two. Therefore, while introducing the child to an apple, the lesson planned should ideally involve activities to let the child experience an apple through touch, smell and taste.

It is important to provide interaction with actual objects first and then determine if the student can transfer that understanding to a model or a raised line drawing. Do not assume that a student has had experiences even with seemingly common items.

In early education, it is important to introduce the student to 3D models before 2D diagrammatic representations of those objects, so that students have a clear understanding.
For example, showing a 3D model of the human heart before the

diagrammatic representation of the same is preferred.

Learning by Doing

"Tell me and I will forget. Show me and I may remember. Involve me and I will understand."
~Chinese Proverb~

Teaching methods today, even for the sighted include a lot of hands-on and experiential learning. This principle of 'learning by doing' enhances the educational experience of both the blind and low vision as well as sighted students in the classroom.
For example,
- Use a doll house to teach the spatial concept of inside and outside at elementary level, make the student go in and out of the doll house.
- Ask the students to blow a balloon to teach them that air occupies space.

Relating Concepts to Real Life Situations

The relation of abstract concepts to tangible realities aids in the learning process.
For example,
- Comparing the computer desktop to a table top,
- Comparing folders and sub folders to rooms and cupboards
- Relating the concept of adding and subtracting negative numbers to borrowing and lending of money.

3.2 Specifics of Working with Blind and Low Vision Students

3.2.1 Reading and Writing Text
(Applicable across Languages, Social Sciences, Environmental Studies, Mathematics, Science etc.)

Blind and low vision persons read and write in a range of formats based on their abilities, needs and preferences. Some of the options they have are:

1. Human Audio Recorded Books
This traditional method of making text material accessible may be used for stories. It allows listening to stories with voice modulations which any student – sighted or blind and low vision – would enjoy.

However, since it does not allow the student to navigate effectively and interact with the recorded content, it is not as preferred as the other options available.

2. Braille – Paper & Paperless
Often mistaken as a language, Braille is a 6-dot script that is used to read and write any language.

- **Paper**

Braille paper is positioned in a slate, and a stylus is used to write Braille manually; thus making this the equivalent of a pen and paper used by sighted persons. It can also be written using manual or electronic Braillers . Embossers connected to computers are used with the help of Braille translation softwares for production of class notes, magazines, academic and recreational books etc.

Image of a Braille slate & stylus which is used to write Braille

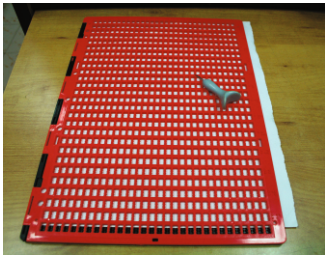


Image of a manual & an electronic Brailler

- **Paperless**

Developments in technology have now made paperless Braille possible. This means that with the help of a refreshable Braille display, all computerised information including web searches, e-mails, e-books etc. can be accessed in Braille without printing a single sheet of paper.

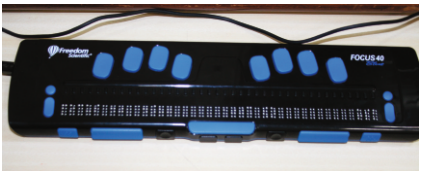
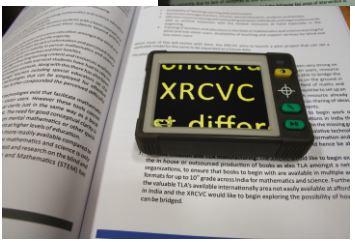


Image of a Refreshable Braille display

3. Low Vision Aids

For low vision students, various optical and electronic magnification tools are available, both handheld as well as fixed units. These provide a range of magnification levels, colour contrast and other options for different eye conditions. Such aids may be used to see things that are near, like a notebook; as well as for seeing distant objects, like the blackboard.

Image of a few optical aids



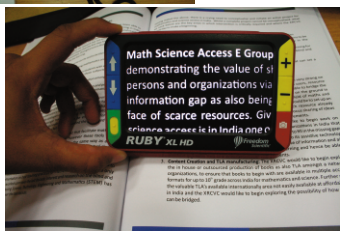


Image of two video magnifiers

4. Computers

Computers are independently operated by blind and low vision users. With screen magnification and screen reading softwares, all functions of the computer can be performed.

- **Computers with Screen Magnifiers**

A screen magnifier is a software that presents computer screen content in an enlarged manner. Such softwares also provide colour contrast options, mouse enhancements etc. to make computers usable by low vision persons. This allows to take down notes and access other materials on the computers as per the visual preference of the low vision person.

- **Computers with Screen Readers**

A screen reader, as the name suggests, reads aloud everything that is displayed on the computer screen as well as every input made by the user. This software converts a regular computer into a talking computer. It can be used by persons with blindness and low vision to work with word documents, excel sheets, power point presentations, sending and receiving e-mails, surfing the internet and so on. This software helps the blind and low vision to independently use computers at school, college, the university or the workplace.

5. Optical Character Recognition (OCR) Scanning System

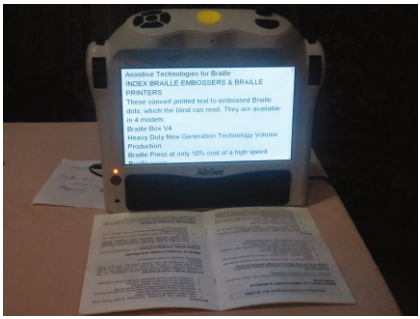


Image of a portable OCR scanning system.

For books which are not available in Braille or e-copy, OCR softwares with mainstream scanners can be used to scan and read content. The softcopy content once created can also be translated to Braille or converted to audio files. Unlike regular scanning procedures, OCR technology allows the scanning of any printed text such that it becomes readable by screen readers. This helps to make books, magazines, notices etc. accessible to blind and low vision persons, and who otherwise would rely on sighted assistance to read hardcopy materials. However, due to variations in fonts, structures etc. in hardcopy materials, the scanned content often needs to be edited.

6. Digital Accessible Information System (DAISY)

The most preferred system nowadays, Digital Accessible Information SYstem (DAISY), is a standard format to produce accessible books. The reason DAISY is preferred over text documents or audio recordings is that every DAISY softcopy book matches the sighted hardcopy page by page. This system allows the user to jump to page, heading level, bookmark, phrase etc. Thus, this format allows a print-disabled person to be on par with those who access regular printed materials. DAISY books may be read on computers, mobile phones or other special DAISY players.

Image of two portable DAISY players

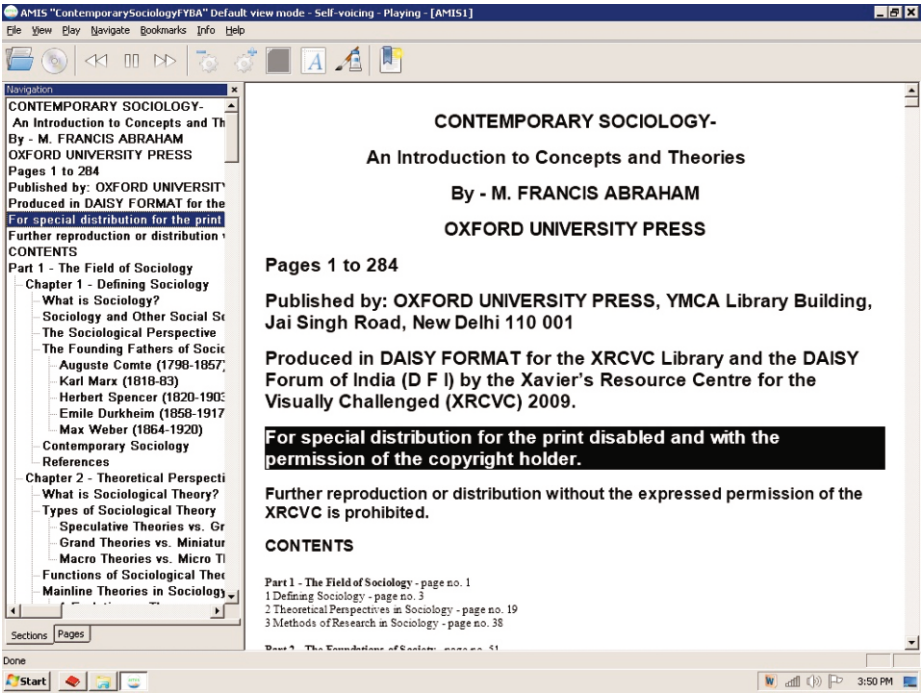


Image of a DAISY file being read on the computer

3.2.2 Reading and Writing Mathematical and Scientific Notations (Applicable for Mathematics and Science content across any subject)

Mathematics is written spatially but always spoken and understood linearly. Blind and low vision students with the right teaching-learning aids can independently read, write and understand mathematics.

Accessing Geometry and other visuals in Mathematics is also possible with Braille geometry kits, tactile drawing paper and other advanced tactile diagrams.

Refer to section 3.2.4 to know more about Access to Diagrams, Maps, Pictures and Audio-Visuals.

The following are a few options for reading and writing Mathematical and Scientific notations independently:

1. Human Audio Recorded Books

Human audio recorded content is an option still exercised by several users for making Mathematics and Science material accessible. This is perhaps due to the lack of awareness of other techniques for creating accessible content. Since it does not allow the student to navigate effectively and interact with the recorded content, it is not as preferred as the other options available. Also, there exists a lack of uniformity in such recordings of the terms used for various symbols and representations.

2. Braille Mathematics Code – Paper & Paperless

For writing Mathematics in Braille, the Nemeth Code is considered most exhaustive. An Indian version of the code is published under the name of Braille Mathematics Code for India. In addition to these, there is a new development in this field under the Unified English Braille Code for technical material.

- **Paper**

Braille Mathematics Code can be written using a slate and stylus, or typed on mechanical or electronic Braillers and stored as paper; thus making this the equivalent of a pen and paper used by sighted persons. Embossers connected to computers are also used with the help of Braille translation softwares for production of Mathematical and Scientific content.

- **Paperless**

Developments in technology have now made paperless Braille possible. This means that with the help of a refreshable Braille display, all Mathematical and Scientific content can be accessed. Back translation softwares are also available to convert electronic Braille into sighted print, making the work undertaken in Braille readable by sighted teacher.

3. Low Vision Aids

For low vision students, various optical and electronic magnification tools are available, both hand held as well as fixed units. These provide a range of magnification levels, colour contrast and other options for different eye conditions. Such aids may be used to see things that are near, like a notebook; as well as for seeing distant objects, like the blackboard.

4. Computers

Computers are independently operated by blind and low vision users. With screen magnification and screen reading softwares, all functions of the computers can be performed.

- **Computers with Screen Magnifiers**

A screen magnifier is a software that presents computer screen content in an enlarged manner. Such softwares also provide colour contrast options, mouse enhancements etc. to make using computers easier for those with low vision. This allows a person with low vision to take down notes and access other materials on the computers according to their visual preference.

- **Computers with Screen Readers**

A screen reader, as the name suggests, reads aloud everything that is displayed on the computer screen. However, reading and writing Mathematical and Scientific notations on computers pose a few challenges as highlighted below.

Even in the sighted world, typing Mathematical and Scientific notations effectively on the computer has not been as straightforward as typing text because of its spatial nature. Inserting even basic mathematical symbols with the keyboard is not easily accessible. Both the sighted and the blind require equation editors or Mathematical languages like TeX, LaTeX etc. to type such notations. Moreover, such content typed using these equation editors is not read out accurately; and the meaningful interpretation of Mathematical and Scientific notations is not effectively done by all screen readers. Hence, for reading books the following options exist.

- **Word and Excel with Screen Readers**

The Mathematical equation editors inbuilt in the word processors are often inaccessible. One can type in Mathematics in the linear mode as well. However in word processors, the screen readers do not read back all Mathematics symbols yet. And the additional challenge is that the written work may not have the same spatial orientation that a sighted teacher would prefer.
For example, in order to be readable by a screen reader, the

fraction $\frac{1}{2}$ will need to be written as 1/2 in a word processor.

- **Screen Reader with LaTeX and MathML files**

Mathematical Markup Language (MathML) is an application for describing mathematical notations and capturing both its structure and content. One way to create such a file is to use LaTeX with a screen reader to type content in a word processor. In order to do so, the student will have to learn the LaTeX code. Once LaTeX is keyed in, softwares can convert it into the spatial mathematical format (as seen by a sighted person). This in turn can be published as a MathML book that is accessible to a screen reader with the use of a math reader add-in to the web browser.

- **MathDaisy™**

MathDaisy™ enables teachers and others to save documents in the DAISY Digital Talking Book format. Students can use MathPlayer™-enabled DAISY player software to read classroom materials in the manner that suits their abilities and preferences best.

3.2.3 Concept Building

(Applicable across all subjects)

The development of concepts is crucial for the cognitive development of all students not only the blind and low vision.

Deliberate, relevant and purposeful lesson planning is ideal. Intentionally incorporate concept development into the lesson plans. Most concepts must be directly taught; and not assumed that the student is learning these skills independently or through passive listening.

Read more about Basic Teaching Techniques for blind and low vision persons in section 3.1.

Different materials and methods may be used for subject-wise teaching which is as follows.

Language

A blind and low vision student, like any other student, can learn and enjoy any language. The Braille script can be used to read and write all languages. Computer assisted writing is also available in a wide range of languages.

New words in language lessons may or may not be visually depicted in a text book for sighted learners. However, all such new words including parts of speech, figures of speech, emotions, sceneries etc. should be presented to blind and low vision students using real objects, real experiences, role plays, hands-on activities, 3D models, tactile 2D pictures teaching-learning aids as much as possible; else these terms remain

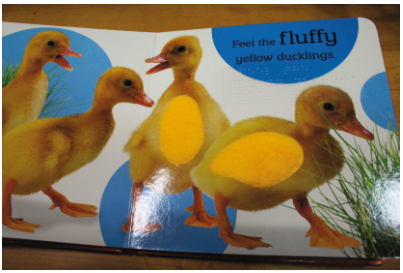


Image of a textured animal book

Often times, blind and low vision students are weak in the area of spellings because they do not get exposure to written matter in their surroundings as much as sighted students would. Talking spelling tutor softwares are available to help give them additional self-practice in this area.

Refer to section 3.2.4 to know more about Access to Diagrams, Maps, Pictures and Audio Visuals used by blind and low vision students.

Social Sciences

Blind and low vision students can learn social sciences with oral instructions and sufficient accessible material (Braille or electronic).

Other areas in social sciences, like historical perspectives, physical environment, maps, globes etc. in social studies can be further enhanced with the use of the following

- First-hand experiences by visits to various landscapes, water bodies etc.
- Trips to museums and archives of historical importance
- Exploration of real objects such as coins, rocks etc.
- Role plays of historical characters
- Tactile relief maps and globes and other teaching-learning aids

These should be used as much as possible; so that there is conceptual clarity of these events and phenomena.

Refer to section 3.2.4 to know more about Access to Diagrams, Maps, Pictures and Audio-Visuals by blind and low vision students; as well as section 3.2.6 for information on Access to Field Trips and Picnics.

Mathematics

The study of Mathematics and Science has been traditionally viewed as being difficult for blind and low vision students to comprehend, as well as for a teacher to teach. However, all Mathematical concepts (arithmetic, algebra and geometry) can be taught using the appropriate techniques and tools. Some of these are given below.

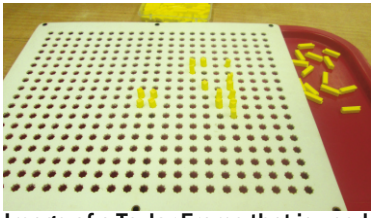


Image of a Taylor Frame that is used to write Arithmetic and Algebra

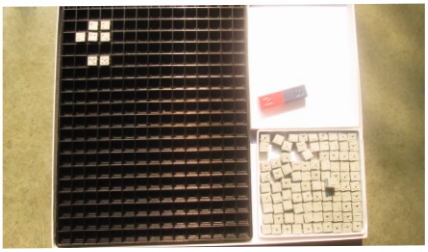
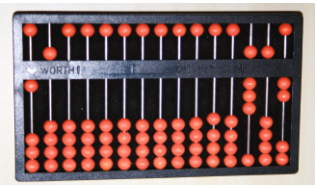


Image of a Cubarithm that is used to write Mathematics

Image of an audio labeller and labels on a tactile graph paper

- Mathematics slates such the Taylor Frame or Cubarithm can be used for understanding spatial orientation of Mathematics whilst writing like sighted writing with side work.
- A simple excel spread sheet with a screen reading and screen magnification software could also be used to achieve writing and understanding of Mathematics. However, this is found useful at a slightly advanced stage once the spatial orientation has been gained through a tactile spatial board.



- The abacus, being a tactile calculation device, can be used for enhancing mental Mathematics skills.

Image of an Abacus used for mental Mathematics

- Braille geometry kits along with tactile drawing paper can be used for constructions of geometrical figures.

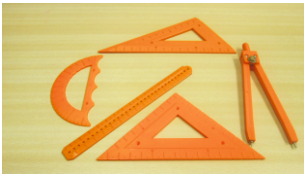


Image of a Braille Geometry kit

Image of a sewell line paper and a rubber mat on a board, with a tactile ruler and stylus

- Hands-on activities with 3D models and 2D representations should be used for teaching shapes and figures, arithmetic operations like counting, addition, subtraction etc., spatial relation words like big-small, long-short, before-after and so on, measurements, surface area, volume, mass, circumference etc.

Image of magnetic geometry shapes

Image of a talking calculator

- Aids like Braille and tactile measuring tapes, talking calculators etc. are also used by blind and low vision students.
- Interactive softwares that permit writing of Mathematics spatially giving audio feedback can be used for practising sums independently.

- Audio supported mental Mathematics exercise softwares for arithmetic and algebra can also be used.

Refer to section 3.2.2 Reading and Writing Mathematics and Scientific Notations for more information.

- **Science**

Blindness and low vision does not influence a student's Mathematical and Scientific aptitude. Science is a subject of exploration, a subject that comes close to the desire to learn and explore, which is high amongst all students including those with blindness and low vision.

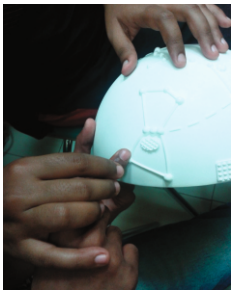
In teaching Science to the blind, the main apprehensions are the study of diagrams, and safety within laboratory settings. Science labs can be accessed by blind and low vision students without posing any danger. Details of the how can be learnt from support organisations.

Some methods to aid in the teaching of Scientific ideas and concepts to the blind and low vision are as given below.

- Giving first-hand experiences through outdoor trips to provide students a multisensory approach to the environment where possible.

For example, modes of transport, types of houses, clothing, weather etc.

- Visits to planetariums, science exhibitions and fairs
- Learning by doing activities for concepts like gravity, force, pressure, dissolution in liquids, friction etc.
- Exploration of real objects such as plants, animals, types of rocks, batteries, simple machines where available
- Explorations of 3D models such as human skeleton, solar system etc.
- Tactile scientific diagrams
- Technologies like automatic stir station, drop counter, talking blood pressure machines, talking glucometer, talking physiotherapy machines, light



3D model of a constellation being explored

probes, colour detectors, talking data collecting equipment for science experiments.

Refer to section 3.2.4 to know more about Access to Diagrams, Maps, Pictures and Audio-Visuals; as well as section 3.2.6 for information on Access to Field Trips and Picnics used by blind and low vision students.

- **Economics**

Blind and low vision students can learn Economics with oral instructions and sufficient accessible material (Braille or electronic). Graphs and tables can be shared with blind and low vision students in accessible formats.

Refer to section 3.2.4 to know more about Access to Diagrams, Maps, Pictures and Audio-Visuals

Mathematics and Statistics applied in Economics can also be taught to blind and low vision students.

Refer to section 3.2.2 to know about Reading and Writing Mathematics and Scientific Notations.

- **Computers**

Computers can be accessed independently by blind and low vision students with the help of screen readers and screen magnifiers.

Some key points to be kept in mind when teaching computers are as follows.

· When being introduced to a computers, blind and low vision students need to be physically oriented to the parts of the computer.

· Blind and low vision students using screen readers control

all events on a computer using only the keyboard and not the mouse. Touch typing (i.e. typing without seeing) is a crucial part in learning computers. The students need sufficient practice in order to create a mental image of the keyboard. This can be achieved with a lot practice as well as using talking typing tutorial softwares.

- Tactile diagrams of the computer screens that appear often like desktop, start menu, dialog box etc. can be used to enhance understanding of the layouts on these screens, and help the student navigate effectively.
- Relating abstract computer concepts to tangible realities aids in the learning process.

For example,

1. Comparing the internal and external parts of the computer to the parts of the human body,
2. Comparing the computer desktop to a table top,
3. Comparing folders and sub folders to rooms and cupboards etc.

Feel free to contact the XRCVC for support on any specific concept to be taught.

3.2.4 Access to Diagrams, Maps, Pictures and Audio-Visuals (Applicable more for Mathematics, Science, Geography, Economics or any visual and audio-visual content)

Whether in the fields of Geometry, Science, Geography or any other subject, when describing a concept is not enough, the use of tactile imagery, graphs, diagrams, pictures etc. make it easier to comprehend ideas. Charts, models, maps, and graphs will have greater educational value for students with blindness and low vision if they can be 'read' using the sense of touch or sound.

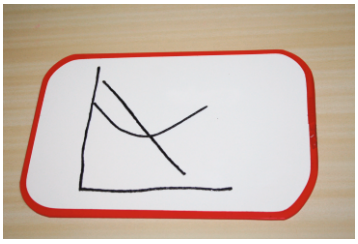


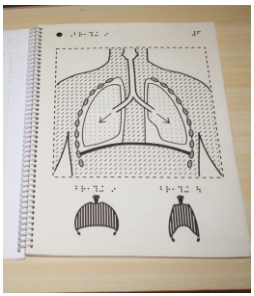
Image of reusable wax sticks used to show a graph

Image of a graph depicted on a Velcro board

Tactile accessible pictures with appropriate large font, Braille and audio labels along with 3D models can make any picture and map accessible to blind and low vision students. These can either be made locally or sourced from support services.

Movies make a class fun for all, including students with blindness and low vision. Simple ideas of either allowing a low vision student to sit in front during a screening or a blind student being paired with a sighted narrator can help all students enjoy movies. An additional strategy could also be in selecting movies with audio description

Image of a tactile diagram with Braille labels



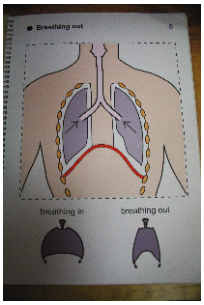


Image of an enlarged diagram with labels in large print

Image of a tactile diagram with Braille and audio labels

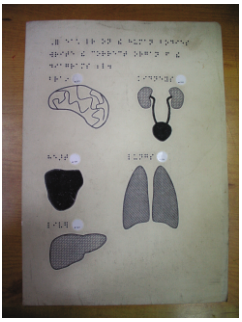


Image of a tactile map of India with Braille, large font and audio labels

Things to consider when working with tactile graphics:

- Ensure orientation is correct when handing over tactile maps, diagrams etc.

For example, when presenting maps, the northern direction should be facing away from the child.

- If you need to show any diagram quickly, draw them on the student's palm with your finger or encourage other students to do that. Other children will learn better as they explain as well.

For example, to quickly show a geometric shape take the blind or low vision student's finger and trace within a fixed space such as his palm, book etc. depicting the same.

- Orient the student to explore the tactile graphic handed over such that they cover all areas of the diagram. Orient them on how to use the index key and other labelling in diagrams or maps.

For example, ask the student to explore moving from the top left of the diagram towards the top right and follow the same process below, so that no portion is missed out.

- Never put objects on the floor as they may become an obstacle for students to move around.

3.2.5 Access to Practicals and Laboratory Work
(Applicable to Science or any other subject involving practicals)

One of the key reasons why blind and low vision students have been traditionally regarded as not being able to pursue the science fields is because of doubts and concerns on how they will handle laboratory apparatus and conduct the required experiments.

However, Science labs can be accessed by blind and low vision students. Research on creating tools and technologies to make the labs accessible are constantly evolving. More details on this can be learnt from support organisations. Few considerations that allow blind and low vision students to access lab work are as follows:

- The observations in experiments are not always visual changes only. By using their other senses, changes can be understood by students comprehensively.
- With proper guidance, blind and low vision students can participate in experiments at times, or by assigning lab partners.
- Increase the safety awareness in students before beginning lab work.
- Have students acquire solid fundamental operation skills required for experiments such as - putting a certain amount of liquid in the test tube, lighting the gas burner, using the special tools and technologies.

Lab Setup Considerations:

- Workspace area should be clearly defined and all apparatus should be in organized well in constricted areas, such as trays to ensure safety.
- Always tell students when appliances are placed or removed from the table.
- Equipment that may topple over by a slight touch should be stabilized.

3.2.6 Access to Field Trips and Picnics

(Applicable to treks, picnics, out of town study trips, visits to museums, zoos)

Doubts associated with including blind and low vision students in treks, picnics, out of town study trips, visits to museums, zoos etc. are often that the school will be held liable, in the case of injury to the blind or low vision student; and that the visual stimuli involved in such activities will be rendered useless to the blind or low vision student.

Safety needs to be ensured for all students, blind or not. Additionally, blind and low vision students learn best through exploration and touch. Field trips are the best mode of learning for them.

Also, teachers should encourage students with blindness and low vision to feel objects at field trips, where possible. Displays with visual content, monuments, wildlife, nature etc. can be made accessible with verbal descriptions by the teacher or classmates. Use of pairing or 'buddy system' is recommended for such situations.

The blind experience the world around them using their other senses and enjoy enriching experiences, as anyone would.

3.2.7 Access to Games, Swimming, Physical Education

Sports are a part of holistic development. Blind and low vision students are actively involved in sports both indoor and outdoor. Simple tactile or auditory modifications to sports equipment and play areas can help blind and low vision students join their sighted classmates on the field. Some of these include:

- Cricket ball with auditory metal bearings
- Football with auditory metal bearings
- Chess board and pegs with simple tactile or audio markers
- Uno, playing cards with simple Braille markings
- Set tactile or auditory markings along the boundaries of play areas.

Few additional considerations for teaching physical education, games or sports are:

* Orient the students to the play area and the adapted sports gear.
* Hand-over-hand approach can be used to describe the stages in an exercise.
* Guide the students, but do not overprotect them. It is much better for a student to get a few bumps and bruises by interacting with his environment than to let inactivity stagnate his body. By moving and physically interacting with their environment, blind and low vision students come across new ways to learn about themselves and their world.
* Use clear and precise descriptive verbal instructions.
* In many activities and games, a partner can greatly enhance the enjoyment and safety for blind and low vision students.

3.2.8 Access to Art, Craft, Theatre, Dance and Other Extra-curricular Activities

Blind and low vision students should skip Art class is a general misconception, because it is considered to be very visual.

Appreciation is something that comes naturally to people. To express oneself creatively is an inherent human desire. Art is a way of doing just that. The process of creating art goes beyond the visuals; it is not linked to only seeing, but also imagination and ideation. Restricting students with blindness and low vision from experiencing art would mean inhibiting individuality. Lack of eyes does not curb one's ability to imagine. Art and craft activities also help develop gross and fine motor skills. Furthermore, some studies show how involvement in the arts facilitates the comprehension of academic subjects. Internationally and within India, there are many blind artists of various visual art forms.

Similar to teaching students physical education, a lot of clear and precise verbal instructions along with hand-over-hand demonstration is required for dance and theatre performances.

Activities such as drawing, colouring, painting, paper craft, collage, needlework, pottery, sculpting etc. can be accessed by blind and low vision students.

Some suggestions:
1. Blind and low vision students can be made to colour within the tactile outline of a drawing made using thread, glitter glue etc.
2. Crayons, paint bottles etc. could be named using large font, Braille or audio labels.
3. Train blind and low vision students on the safe use of sharp objects such as scissors, needles etc.
4. Allow extra time for students to explore the tools being used.

Teaching Colour to Blind and Low Vision Students

Even if the blind and low vision cannot see, they must be taught the concept of different colours, in the same way and for the same reasons that you would teach sighted students. Colour is a part of the world and cannot be ignored while teaching. Blind and low vision students would understand colours through ordinary associations such as blue sky and green grass.

3.3. Role of the Special Educator and the Subject Teacher

3.3.1 The Special Educator–Teacher Team

Often schools who wish to be inclusive have doubts related to:

× Creating accessible materials for blind and low vision students

× Spending additional time in planning and preparing teaching-learning aids

× Knowledge of special skills like Braille, assistive equipment etc.

The student, more often than not, will have a special educator who will help them learn Braille and the other plus curriculum skills. The school could also provide an in-house special educator equipped with these skills.

What is important to remember, though, is that the subject teacher and the special educator are partners in the learning of blind and low vision students. Whilst the special educator could ensure that tools are available and the student is skilled in using the required tool, the subject teacher will need to ensure that subject learning happens.

3.3.2 Specifics Where the Class / Subject Teacher Can Help

The amount and type of support required from a special educator differs as the student moves to higher classes. Ideally, the support required in higher classes should reduce. All plus curriculum – Braille, orientation and mobility, independent living skills, keyboarding and computer skills – specific to blind and low vision students should be covered at the elementary level.

Also, additional use of teaching-learning aids (where the special educator may or may not be involved) may be required at more early stages to develop the concepts in the mind of the student, rather than at later ages, so that the student has a good foundation to build on.
For example, models of farm animals may be needed to be shown in the younger years. Later on, by just mentioning the names of these animals, the student will be able to relate to the same.

Making content accessible is a need that will continue throughout the education of the blind and low vision student.
Therefore, specific areas where the classroom teacher's help is required in the education of blind and low vision students are listed below chronologically.

Class 1 to 5

- Become familiar with the plus curriculum goals and objectives planned by the special educator.
- Keep the choice of teaching-learning tools student-dependent i.e. if the student prefers Braille, allow him to use that in class. This can be transcribed later for the teacher's reference.
- Share the weekly lesson plans and syllabus in advance with the special educator. So that he/she has sufficient time to prepare the aids and materials needed to understand each topic.
- Inform the special educator to prepare the student with any pre-topic skills or information he may need related to each subject.

For example, it is essential for blind and low vision students to learn touch typing before introducing Computers in the curriculum.

Across Any Age - Class 1 onwards

- Ensure that all teaching content, if already available in softcopy, is shared with the student or special educator. This significantly reduces the effort to make the content accessible.
- Share, in advance, the list of reference books and other materials required for the academic year. This gives the student sufficient time to source these in accessible formats.
- Learn about the student's sensory strengths and weaknesses, and academic needs to develop appropriate strategies.
- Become aware about the assistive equipment and other tools used by the blind and low vision students.
- Be alert to ensure learning and do not handhold.
- Always keep the child as the centre of any learning plan. Assistance can be sought of independent support organisations that would be able to guide with the latest in the field.

Also, refer to section 3.1 for information on Basic Teaching Techniques.

4. ADDITIONAL AREAS OF INCLUSION

4.1 Examinations

There are set examination-taking guidelines set out by the Ministry of Social Justice and Empowerment, Government of India, that need to be followed by all educational institutions. The same are attached as Annexure A. The student is offered the choice to do their exam independently on a computer or with the use of scribes.

For practical examinations also, there are guidelines by the Central Board of Secondary Education (CBSE) as well as the Maharashtra State Board of Secondary and Higher Secondary education and University of Mumbai attached as Annexure B, C, D and E.

For questions involving diagrammatic and visual interpretations, choices of alternative non-visual questions or tactile diagrams with appropriate large font, Braille or audio labels need to be provided.

For diagrammatic drawing questions, the student will be exempted from drawing diagrams, and be provided alternative questions or be permitted to draw diagrams on tactile papers or be asked to write a verbal description of the diagram at hand.

Oftentimes, with regards examinations, a challenge that tends to come up is that other parents will complain that this student gets good marks because of their writer. We must always have a writer one year junior to the student.

If this concern comes up, the solution lies in the school ensuring strict invigilation and that malpractices are strictly punished. It does not lie in the student not being allowed a writer or insisting on junior writers alone; especially for lower grades, this is totally impractical. A Class 2 student cannot be expected to write another person's exam. Parent Teacher Association members or teachers need to be encouraged to be writers/scribes.

Inclusion is only achieved when there is equality. Being lenient for disability is the biggest form of exclusion which will lead to lasting damage. Grading has to be on par with the non-disabled.

Scribe-written examinations have to be given the exception for spelling mistakes of general language but not of technical content. Whilst it is impractical for the student taking examination to spell out each word as they dictate, they are expected to spell out technical content words for marking. This is also especially true for language papers.

4.2 Working with Emotional Adjustment

Certain apprehensions related to bullying of blind and low vision students in the classroom often arise in one's mind. But dwelling too much on these doubts may make the student pick up these doubts and fears.

Encourage all students to be friends with one another. Do not avoid questions regarding the blind and low vision. Answer sighted students with factual answers without trying to mislead or protect. If required, awareness and sensitization workshops can be arranged in partnership with support organisations.

4.3 Parent–Student–School Partnership

“Parents will know the answers; it is their child so I can check with them for doubts.” is often a misconception by the teachers.

Always remember that parents are as much a part of society as the school is. Having a child with blindness or low vision does not come with a manual on ‘HOW TO’. Oftentimes, the parents may have their own emotional concerns and may over protect or over push the child. To keep the child as the centre of any learning plan, is most critical, and for which assistance can be sought of independent support organisations that would be able to guide with the latest in the field.

4.4 Institution Environment

4.4.1 Physical Accessibility

Given below are a few classroom design tips to keep the surroundings safe and easily accessible to all students, while keeping in mind the needs of blind and low vision students.

A Place For Everything, & Everything In Its Place

· Familiarize the student with the school building, the classroom and other necessary areas like the cafeteria, the auditorium etc. Do this preferably at the beginning of the school year.
· Be sure that the activity areas are well-defined.
· The layout of the classroom, cafeteria etc. should be maintained as much as possible, so that the student doesn't have to encounter constant change in his regular environment. This will make the materials easily accessible to the student and everyone else.
· In case of a change in the placement of any object or piece of furniture, see that the student is aware of the new position.
· Ensure well-organised classrooms, corridors and stairs that are free of visual and physical clutter.
· Arrange the furniture to provide clear traffic paths. Make sure that no windows, drawers, cupboard doors and other objects are left open or jutting out.
· Ensure that the routes or pathways are safe and accessible to help develop orientation and mobility skills.
· Tack or tape down scatter rugs or any electrical cords.

Signage

· Labelling makes areas, materials etc. easy to find and even helps to promote literacy for all students. Labels could be in visual, tactual and auditory formats.
· Large font size with uniform, bold, well-spaced letters, Braille or audio labels can be used for labelling.

· Using a clear and consistent system for labelling learning areas will help the students connect the name of the location.
For example, use any one of these terms throughout - restroom, washroom, toilet, when labelling such a room.
· If the student does not have functional vision or is at a pre-symbolic level, use objects to label. Encourage literacy by pairing the objects with print or Braille labels.
· Place signs at the eye level of the students in strategic locations for the students' observation and exploration.
· Create landmarks to help students develop orientation and mobility skills. Carefully chosen sound, texture, scent (but only if it is a constant scent) or highly visible clues i.e. with good size and contrast can help the student to move around the classroom more confidently.

Lighting Requirements

· Good lighting is key for those with low vision.
· Consider the source of lighting. The student should not face the light from windows or lighting equipment.
· Avoid standing directly in front of a window or light source when teaching.

Seating Placement

· The seating in the classroom will depend on the functional vision of the student. Determine where the student's best visual field is and his ideal position.
· Usually a student with blindness or low vision should sit in the front of the classroom to be in closer proximity to see the teacher, the board, audio-visuals, demonstrations, etc. But he may know where best to sit.
· If the student uses electronic equipment, he will need to be seated near a power outlet.
· The student may need extra desk and shelf space to accommodate special materials and equipment.

4.4.2 Culture of Inclusion

The biggest barrier in inclusion is the barrier of the human mind. The culture of inclusion can be created by way of internal trainings and sensitisation programmes across students, parents, teachers, non-teaching staff and management.

Awareness initiatives by the XRCVC, including mega events, workshops and talks, aim at breaking myths resulting from both lack of information and a closed mind-set to help individuals, groups and organisations rethink their ideas of disability and inclusion.

One such mass awareness event organised by the XRCVC is Antarchakshu – The Eye Within ™. A one-of-a-kind disability and simulation experience, Antarchakshu has been conceptualised and developed by the XRCVC. It is a leading event to spread awareness about the lives of persons with blindness and low vision.

Target-specific, need-based and skill-oriented disability sensitisation workshops and programmes can be organised by the XRCVC, on request. These are conducted for varied groups from teachers, parents, students, and any other group that would like to get a general or specific insight into the lives of blind and low vision persons.

4.4.3 End-to-End Inclusion Model — From Reluctance to Confidence

Right from admitting blind and low vision students, to day-to-day teaching, to classroom interaction, to creating accessible materials, examinations and environments would make an inclusive model.

Admitting a student and leaving him to fend for himself cannot be called inclusion. Overcoming reluctance by getting equipped (with the help of support organisations) will build confidence.

5. SCOPE FOR STUDENTS WITH BLINDNESS AND LOW VISION

Blind and low vision persons are involved in careers as diverse as the sighted such as lawyers, financial experts, social workers, teachers and educators, bankers, photographers, physiotherapists, musicians, computer programmers, mathematicians, managers, businessmen, entrepreneurs, dancers and many more.

Life, for persons with blindness and low vision, is as much about living independently and productively, as for a sighted person. Primary education is only a stepping stone for diverse life progressions based on interest and aptitude just like the sighted.

REFERENCES & ADDITIONAL RESOURCES

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M.N.G. Mani. (1997). Techniques of teaching blind children.

J. Kirk Horton. (1988). Education of Visually Impaired Pupils in Ordinary School.

Website Links-

http://www.tsbvi.edu/program-and-administrative-resources/3243-tips-for-working-with-blind-students
http://www.teachingvisuallyimpaired.com/classroom-design-tips.html
http://www.teachingvisuallyimpaired.com/guiding-principles.html
http://www.education.gov.sk.ca/vision
https://nfb.org/images/nfb/publications/fr/fr04/issue2/f040207.html

GLOSSARY

The terms below have been defined as per their application and usage within this handbook.

2D Representation:
A representation of real objects in 2-dimensional form on a flat surface

3D Model:
An artificially created 3-dimensional replica of real things

Access:
Ability of blind and low vision persons to participate meaningfully and wholly

Accessible Format:
Electronic formats that are accessible with either screen readers or magnifiers to blind and low vision persons

Accessible Technology:
Technologies which are adapted or modified such that they help people with various limitations (such as vision impairments) to perform tasks that they were earlier unable to accomplish

Assistive Equipment:
Equipment that assists blind and low vision persons

Audio Label:
A special kind of label that when used with its corresponding labeller, allows to record a message. The labeller can then be used to playback the message associated to that label.

Audio-visual:
Refers to works with both a sound and a visual component

Auditory Sense:
Relating to or experienced through the sense of hearing

Blindness:
Legal blindness ranges from a visual acuity of 6/60 (20/200) in the better eye after correction to having no usable vision, or a field of vision reduced to an angle of 20 degrees.

Braille Mathematics Code:
Braille codes (Nemeth, Unified English Braille Code) that provide symbols for all mathematical and scientific notations

Braille:
A 6-dot script used by blind and low vision individuals to read and write

Colour Blindness:
Diminished ability of the visual system to perceive differences in colour

Good Contrast:
Relates to the correct combination of colours that enables a low vision individual to distinguish their environment and other material

Handbook:
A quick reference guide book

Hand-over-hand:
The technique of covering and guiding the student's hand to explore something or to perform an action

Hands-on:
Physical involvement and complete interaction with the task or activity

Hardcopy:
Materials in formats that are cannot be accessed electronically and that can be held in the hand

Hardware:
Physical components of a computer or other electronic system; parts that you are able to touch, e.g. the computer monitor, the mouse etc.

Incidental Learning:
Refers to that learning that is not planned, and outside any formal learning

Inclusive Schools / Mainstream Schools:
A school with blind or low vision students studying along with sighted students; that is informed and equipped to provide a holistic education to all

Independent Living Skills:
Those daily living skills that blind and low vision persons need to be trained in, to make them not dependent, such as self-hygiene and grooming, activities related to meal time - placement of food in plate when eating, serving, washing your plate

Kinesthetic Sense:
The ability of the brain to perceive the location or relationship of parts of the body as they move, without checking their location with any other sense

Large Font:
Print that is appropriately enlarged such that it can be readable by low vision individuals

Low Vision Aids:
Optical or non-optical aids that can be used by low vision persons to see near and far distances etc.

Low Vision:
Reduced central acuity or visual field loss which, even with the best optical correction provided by regular lenses, still results in blindness and low vision from a performance standpoint

Mathematical and Scientific notations
Relates to Mathematic and Scientific symbols, numbers, representations

Multisensory:
With the use of more than one sense

Olfactory Sense:
Relating to or experienced through the sense of smell

Optical Character Recognition (OCR):
Refers to scanning systems where print material can be converted into synthetic speech (screen reader) readable format

Optical:
Relating to sight

Orientation and Mobility Skills:
The ability to move from one location to another in a safe and efficient manner

Orientation:
Relates to making blind and low vision persons aware in an organized or systematic manner all aspects of an environment or an object

Plus Curriculum:
The additional curriculum areas that are needed by blind and low vision students to be on par with their sighted peers such as sensory training, Braille skills, Orientation and Mobility skills and other independent living skills

Real Objects:
Objects that are available in the environment and not artificially created

Refreshable Braille Display:
An electronic hardware device which permits Braille reading by a system of refreshable Braille dots

Screen Magnifiers:
A software that magnifies areas on the computer screen while also providing other customization options colour contrast options, mouse enhancements etc. to make computers usable by low vision persons

Screen Readers:
A software that reads aloud everything that is displayed on the computer screen as well as every input made by the user

Sensory Training:
Learning to effectively use the senses (hearing, touch, smell and residual vision, if any)

Sighted Guide Technique:
The sighted guide technique is the universal manner acceptable while escorting blind and low vision persons. This requires the person who can see i.e. the sighted guide to offer his upper arm to the blind or low vision person such that that person stands just about half a step behind, and holds the guide's left elbow with his right hand or right elbow with his left hand. This ensures that every turn and every step is more easily identifiable. In the case of young students, for whom holding an adult's upper arm is not practical, they may be taught to hold on to the wrist of the adult sighted guide.

Sighted:
Refers to one who is not blind or low vision

Softcopy:
Materials in formats that are only electronically accessible and cannot be touched

Software:
Computer programs and related data that provide the instructions to tell the computer hardware what to do and how to do it; a collection of instructions installed into the computer, e.g. the internet browser, the system calculator

Spatial Concept:
The ability of an observer to perceive the position of two or more objects in relation to self and others

Spatial Orientation of Mathematics/ Spatial Mathematics:
Relates to mathematical figures that are not represented linearly i.e. in a single line, or such that the figures are meaningfully arranged to represent a particular idea
For example, place value, fractions, long division etc.

Special School:
A school solely for blind and low vision students

Support Systems/Support Organisations:
Centres that provide specific need based assistance to stake holders of blind and low vision persons

Tactile Diagrams / Graphics:
Images, pictures or graphics that are meaningfully raised such that they can be visualised and understood with the sense of touch

Tactile:
Pertaining to the sense of touch

Tactual:
By the sense of touch

Teaching-Learning Aids (TLA):
Materials that enhance the teaching-learning process during a lesson

Visual Impairment:
Any optically or medically diagnosable condition in the eye(s) or visual system that affects the development and normal use of vision
Impairments may be of a minor nature, may be correctable, or may be severe and uncorrectable.

White Cane:
A cane which is designed for travel purposes for blind and low vision individuals. Its purpose is to detect obstacles and surface changes in the travel environment of its user.

Annexure A- Ministry of Social Justice and Empowerment Guidelines for conducting Written Examination for Persons with Disabilities, February 2013

F.No. 16-110/2003-DD.III
Government of India
Ministry of Social Justice & Empowerment
Department of Disability Affairs
***

Shastri Bhawan, New Delhi
Dated: 26th February, 2013

Office Memorandum

Subject: Guidelines for conducting written examination for Persons with Disabilities.

The undersigned is directed to say that Chief Commissioner of Persons with Disabilities (CCPD) in its order dated 23.11.2012 in case No. 3929/2007 (in the matter of Shri Gopal Sisodia, Indian Association of the Blind Vs. State Bank of India & Others) and in case No.65/1041/12-13 (in the matter of Score Foundation Vs. Department of Disability Affairs) had directed this Ministry to circulate guidelines for the purpose of conducting written examination for persons with disabilities for compliance by all concerned. In compliance of the above order, this Ministry hereby lays down the following uniform and comprehensive guidelines for conducting examination for the persons with disabilities as recommended by CCPD:-

I. There should be a uniform and comprehensive policy across the country for persons with disabilities for written examination taking into account improvement in technology and new avenues opened to the persons with disabilities providing a level playing field. Policy should also have flexibility to accommodate the specific needs on case-to-case basis.

II. There is no need for fixing separate criteria for regular and competitive examinations.

III. The facility of Scribe/Reader/Lab Assistant should be allowed to any person who has disability of 40% or more if so desired by the person.

IV. The candidate should have the discretion of opting for his own scribe/reader/lab assistant or request the Examination Body for the same. The examining body may also identify the scribe/ reader/lab assistant to make panels at the District/Division/ State level as per the requirements of the examination. In such instances the candidates should be allowed to meet the scribe a day before the examination so that the candidates get a chance to check and verify whether the scribe is suitable or not.

V. Criteria like educational qualification, marks scored, age or other such restrictions for the scribe/reader/lab assistant should not be fixed. Instead, the invigilation system should be strengthened, so that the candidates using scribe/reader/lab assistant do not indulge in mal-practices like copying and cheating during the examination.

VI. There should also be flexibility in accommodating any change in scribe/reader/lab assistant in case of emergency. The candidates should also be allowed to take more than one scribe/reader for writing different papers especially for languages.

VII. Persons with disabilities should be given the option of choosing the mode for taking the examinations i.e. in Braille or in the computer or in large print or even by recording the answers as the examining bodies can easily make use of technology to convert question paper in large prints, e-text, or Braille and can also convert Braille text in English or regional languages.

VIII. The candidates should be allowed to check the computer system one day in advance so that the problems, if any in the software/system could be rectified.

IX. The procedure of availing the facility of scribe should be simplified and the necessary details should be recorded at the time of filling up of the forms. Thereafter, the examining body should ensure availability of question papers in the format opted by the candidate as well as suitable seating arrangement for giving examination.

X. The disability certificate issued by the competent medical authority at any place should be accepted across the country.

XI. The word "extra time or additional time" that is being currently used should be changed to "compensatory time" and the same should not be less than 20 minutes per hour of examination for persons who are making use of scribe/reader/lab assistant. All the candidates with disability not availing the facility of scribe may be allowed additional time of minimum of one hour for examination of 3 hours duration which could further be increased on case to case basis.

XII. The candidates should be allowed to use assistive devices like talking calculator (in cases where calculators are allowed for giving exams), tailor frame, Braille slate, abacus, geometry kit, Braille measuring tape and augmentative communication devices like communication chart and electronic devices.

XIII. Proper seating arrangement (preferably on the ground floor) should be made prior to the commencement of examination to avoid confusion or distraction during the day of the exam. The time of giving the question papers should be marked accurately and timely supply of supplementary papers should be ensured.

XIV. The examining body should also provide reading material in Braille or E-Text or on computers having suitable screen reading softwares for open book examination. Similarly online examination should be in accessible format i.e. websites, question papers and all other study material should be accessible as per the international standards laid down in this regard.

XV. Alternative objective questions in lieu of descriptive questions should be provided for Hearing-Impaired persons, in addition to the existing policy of giving alternative questions in lieu of questions requiring visual inputs, for persons with Visual Impairment.

2. It is requested to ensure that the above guidelines are scrupulously followed while conducting examination for persons with disabilities. All the recruitment agencies, Academics/Examination Bodies etc. under your administrative control may be advised appropriately to ensure compliance of implementing these guidelines. Action taken in this regard may be intimated to this office.

3. The above guidelines are issued with the approval of Hon'ble Minister (Social Justice & Empowerment).

Yours faithfully,

(Jagdish Kumar)
Deputy Secretary to the Govt. of India

To

1. Secretary of all Ministries/Department.
2. Secretary, UPSC, Shahjahan Road, New Delhi.
3. Chairman, SSC, Block No.12, CGO Complex, Lodhi Road, New Delhi-110003.
4. Chairman, University Grants Commission with a request to issue necessary instructions to all universities including Deemed Universities for compliance.
5. All National Institutes and RCI under administrative control of Department of Disability Affairs, Ministry of SJ&E, New Delhi

Copy to : CCPD, Sarojini Bhawan, Bhagwan Dass Road,New Delhi with reference to order dated 23.11.2012 in case No. 3929/2007 and in case No.65/1041/12-13.

Annexure B- CBSE Circular on Science Education at XI and XII Level

CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Union Ministry of Human Resource Development Govt. of India)
SHIKSHA KENDRA, 2, COMMUNITY CENTRE,
PREETVIHAR, DELHI – 110 301

TELEPHONE NOS. 011-22517250/22420400

No.COORD/AS(C)/2010 02.11.2010

To Heads of all the
Affiliated schools of the Board

Sir/Madam,

You are aware that a provision has been made for providing alternate questions in the subjects of History, Geography and Economics at the Senior level for visually challenged candidates. In order to enable such students to opt for Science based subjects at the senior level the Board will be administering separate question papers without any visual input in the subjects of Physics, Chemistry, Biology and Mathematics also w.e.f 2011 Examinations.

Yours faithfully,

(M.C.SHARMA)
CONTROLLER OF EXAMS.

Annexure C- CBSE Circular on Practical Examination in Science at XI & XII Level

Website: www.cbse.nic.in 23237779

Central Board of Secondary Education

(An autonomous Organisation under the Union Ministry of Human Resource Development, Govt. of India)

'Shiksha Sadan', 17-Rouse Avenue, New Delhi – 110 002

CBSE/EO(SD)/ 2011/ **Dated:23.12.11**
Circular No. 91

All the Heads of Institutions
Affiliated to the Board

Dear Principal,

With reference to Circular No. 68/2011 dated 16.09.2011, you are already aware that in order to facilitate visually impaired candidates to take Science subjects at Senior Secondary Level, CBSE has decided to provide separate question papers in lieu of Practicals to visually impaired students, containing Multiple Choice Questions, based on practical content, in the subjects of Physics, Chemistry and Biology. You are also aware that this new scheme will be implemented for students of Class XI from 2012 March Examination and for students of Class XII from 2013 Board Examination.

In this regard, the guidelines for the question paper in Practicals for visually impaired students in the subjects of Physics, Chemistry and Biology alongwith the list of practicals and a Sample Question Paper is enclosed herewith for ready reference of teachers and students for the present batch of Class XI.

It may be reiterated here that this provision of alternate question paper in lieu of practicals at Sr. Secondary level for visually impaired students is given only for CBSE Board Examination. Students should also carefully refer to the requirements of the admitting Organization/College/University for further upward mobility in their academic career related to these subjects.

You are requested to disseminate this information to all concerned.

Yours faithfully,

(Dr. Srijata Das)
Education Officer

Copy to:

1. The Commissioner, Kendriya Vidyalaya Sangathan, 18-Institutional Area, Shaheed Jeet Singh Marg, New Delhi-110 016.
2. The Commissioner, Navodaya Vidyalaya Samiti, A-28, Kailash Colony, New Delhi.
3. The Director of Education, Directorate of Education, Govt. of NCT of Delhi, Old Secretariat, Delhi-110 054.
4. The Director of Public Instructions (Schools), Union Territory Secretariat, Sector 9, Chandigarh-160 017.
5. The Director of Education, Govt. of Sikkim, Gangtok, Sikkim – 737 101.
6. The Director of School Education, Govt. of Arunachal Pradesh, Itanagar-791 111
7. The Director of Education, Govt. of A&N Islands, Port Blair-744 101.
8. The Secretary, Central Tibetan School Administration, ESSESS Plaza, Community Centre, Sector 3, Rohini, Delhi-110 085.
9. All the Regional Officers of CBSE with the request to send this circular to all the Heads of the affiliated schools of the Board in their respective regions.
10. The Education Officers/AEOs of the Academic Branch, CBSE.
11. The Joint Secretary (IT) with the request to put this circular on the CBSE website.
12. The Library and Information Officer, CBSE
13. EO to Chairman, CBSE
14. PA to CE, CBSE
15. PA to Secretary, CBSE
16. PA to Director (Acad.)
17. PA to HOD (AIEEE)
18. PA to HOD (Edusat)
19. PRO, CBSE

(Dr. SRIJATA DAS)
EDUCATION OFFICER

CHEMISTRY
PRACTICALS
Class XI

Guidelines for preparing question paper

In lieu of the practical examination for regular students, visually impaired students will give written exam consisting of 25 MCQ's each of one mark and five marks will be provided for viva voce.

- The time duration for the written exam will be 1 hr 30 minute.
- Candidates are not required to submit any practical record file at the time of practical examination.
- Questions will be based upon the knowledge aquired in the laboratory and understanding of the concepts.
- Only the basic details of chemicals , apparatus and theory involved would be included in the MCQ's
- Some of the questions should be based on day to day life experiences.
- Quantitative calculations would be assessed in such a way that the student is able to do orally.

Blue Print

S.No	Topic	No. of questions
1.	Basic laboratory Techniques	No question
2.	Characterization and Purification of chemical substances	04
3.	Experiments based on pH	03
4.	Chemical Equilibrium	03
5.	Quantitative Estimation	07
6.	Qualitative Analysis	08
	Total	**25**

List of Practicals

1. Characterization and Purification of Chemical Substances

Crystallization of an impure sample of any one of the following: alum, copper sulphate, benzoic acid.

2. Experiments based on pH

Any one of the following experiments:

- Determination of pH of some solutions obtained from fruit juices, varied concentrations of acids, bases and salts using pH paper or universal indicator.
- Comparing the pH of solutions of strong and weak acids of same concentration.

3. Chemical Equilibrium

One of the following experiments:

- Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
- Study the shift in equilibrium between [Co(H2O)6]2+ and chloride ions by changing the concentration of either of the ions.

4. Quantitative estimation

- Using a chemical balance.
- Preparation of standard solution of oxalic acid.
- Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.
- Preparation of standard solution of sodium carbonate.
- Determination of strength of a given solution of hydrochloride acid by titrating it against standard sodium carbonate solution.

5. **Qualitative Analysis**
   Determination of one anion and one cation in a given salt
   Cations – Pb_2+, Cu_2+, As_3+ Al_3+ Fe_3+ Mn_2+, Ni_2+, Zn_2+, Co_2+Ca_2+, Sr_2+, Ba_2+, Mg_2+, NH_4+
   Anions – CO_3^{2-}, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO^-_2, NO^-_3, CI^-, Br^-, I^-, PO^{3-}_4, $C_2O^{2-}_4$, $C_2O^{2-}_4$, CH_3COO^-

Sample Question Paper- CHEMISTRY
PRACTICALS
CLASS XI

Q1. The given impure sample is purified by dissolving it in water, then filtering and heating the solution in a China dish till saturation followed by cooling to get the pure substance. This technique is called as:

a) Separation
b) Crystallisation
c) Fractional Crystallisation
d) Evaporation

Q2. We use concentrated sulphuric acid to determine the melting point of the organic compound because

a) sulphuric acid is easily available in the laboratory.
b) sulphuric acid is easy to handle
c) sulphuric acid has low boiling point.
d) it has high boiling point and is stable when heated.

Q3. Some of the liquid substances have very high boiling points because they have

a) high molecular mass and strong intermolecular forces.
b) low molecular mass and weak intermolecular forces.
c) high molecular mass and weak intermolecular forces.
d) low molecular mass and strong intermolecular forces.

Q4."Purity" of a substance is best determined by

a) melting point
b) boiling point
c) crystallization point
d) freezing point

Q5. On adding ammonium chloride to ammonium hydroxide solution, pH of ammonium hydroxide solution will :

a) increase
b) decrease
c) remain same
d) none of these

Q6.There are four different solutions in four test tubes A, B, C and D. The pH value of these solutions are 12, 5, 7 and 13 respectively. Acid is present in:

a) test tube A and B both.
b) test tube B only
c) test tube C and D only both
d) test tube A and D both.

Q7. An unknown solution A is taken in the test tube whose pH value has been found to be 12.0. Another solution B is added to the solution A drop by drop. If the pH of the solution A changes to 5 after sometime, then the solution B is:

a) water
b) base
c) acid
d) salt Solution.

Q8. A complex is formed when HCl is added to a solution containing $COCl_2$.
The complex is:

a) $[Co(H_2O)_6]^{2+}$
b) $[CoCl_4]^{2-}$
c) $[CoCl_4]^{2+}$
d) $[Co(H_2O)_6Cl_2]$

Q9. An equilibrium is attained when we mix 10 ml of 0.1 M cobalt nitrate solution and 10 ml of 0.1 hydrochloric acid. The colour of the solution at equilibrium is pink. What shall be added to the solution to shift the equilibrium to the right direction with the change in colour from pink to blue?

a) water
b) brine Solution
c) hydrochloric acid
d) nitric acid

Q10. The solution of the complex formed by mixing $FeCl_3$ with KCNs is taken into four test tubes 1, 2, 3 & 4. Then water, Ferric chloride, sodium chloride and sodium sulphate solutions are added to the test tubes respectively. The colour of the solution becomes dark in the test tube:

a) 1 and 4
b) 2
c) 1 and 3
d) 4

Q11. The solution which cannot be considered as a primary standard solution is:

a) Mohr's salt solution
b) oxalic acid solution
c) sodium hydroxide solution
d) Sodium carbonate solution

Q12. The strength of oxalic acid in g/L if 20 ml of $\frac{M}{10}$ sodium hydroxide is used to neutralize 10 ml of oxalic acid solution will be

a) 0.126 g/L
b) 1.26 g/L
c) 0.63 g/L
d) 6.3 g/L

Q13. Following are the given steps of Acid-Base titration:
(i) filling of burette or conical flask with acid or base.
(ii) rinsing of burette or pipette
(iii) titration
(iv) addition of indicator to the solution in the conical flask.

The correct sequence of steps should be
a) (i), (ii), (iii), (iv)
b) (ii), (i), (iv), (iii)
c) (iv), (iii), (i), (ii)
d) (ii), (iii), (iv), (i)

Q14. During the titration of oxalic acid and sodium carbonate the indicator which is most suitable to use is:
a) methyl orange
b) phenolphthalein
c) methyl orange and phenolphthalein
d) methyl Red

Q15. In the titration of oxalic acid with sodium hydroxide, the colour of the solution changes from pink to colourless at the end. The ion which have more concentration in the conical flask is
a) H_3O^+
b) OH^-
c) $-C_2O_4^-$
d) Na^+

Q16. The quantity of oxalic acid needed to prepare 100 ml of $\frac{M}{10}$ oxalic acid solution is

[Molecular wt. of oxalic acid is 126 u]
a) 1.26 gm
b) 63 gm
c) 12.6 gm
d) 6.3 gm

Q17. 20 ml of water is added to 20ml of $\frac{M}{20}$ sodium carbonate solution in the conical flask. The molarity of the solution obtained will be

a) $\frac{M}{10}$
b) $\frac{M}{20}$
c) $\frac{M}{30}$
d) $\frac{M}{}$

40

Q18. On addition of ammonium chloride to ammonium hydroxide solution, pH of ammonium hydroxide will :

a) increase due to decrease in OH^- ion
b) decrease due to increase in NH^+_n ion
c) remain same as if forms buffer solution
d) decrease due to decrease in OH^- ion

Q19. Lead is included in Ist as well as IInd group of cation analysis because:

a) lead Ion is insoluble in dil. HCl.
b) lead does not give Ist group test easily.
c) lead Chloride is sparingly soluble in dil. HCl.
d) none of the above

Q20. Original solution is not prepared in conc. HNO_3 or H_2SO_4 because:

a) they are strong acids
b) they do not dissolve any salt
c) they oxidize H_2S and form insoluble salts
d) none of the above

Q21. Sodium carbonate cannot be used in place of ammonium carbonate for the identification of group V radicals. This is because:

a) sodium Ions interfere in the detection of group V radicals
b) concentration of carbonate ions is very low
c) sodium will react with the acid radicals
d) magnesium will be precipitated

Q22. Only group IInd and IV cations get precipitated as sulphides on passing H_2S gas through the solution. But on passing H_2S gas in acidic medium cations of only group II get precipitated due to:

a) high solubility product of group IV sulphides
b) high solubility product of group II sulphides
c) low solubility product of group IV sulphides
d) low solubility product of sulphides of group II

Q23. When an unknown salt is treated with dilute H_2SO_4 solution, the gas liberated has the smell of rotten eggs which when passed through lead acetate solution turns black. The ion in the unknown salt is

a) acetate Ion
b) nitrite ion
c) carbonate ion
d) sulphide ion

Q24. The product formed by mixing the solution of potassium ferrocyanide with ferric chloride solution is:

a) ferro – ferricyanide
b) ferric – Ferro cyanide
c) ferri –ferricyanide
d) none

Q25. During lassiagne's test for identification of nitrogen, sulphur and halogens in the organic compound, the formation of red coloured compound on addition of ferric chloride to Lassaigne's solution indicates the presence of:

a) nitrogen only
b) nitrogen and sulphur
c) sulphur only
d) chlorine only

Answer Key

Q.No.	Answer	Q.No.	Answer
1	(b)	19.	(c)
2.	(d)	20.	(c)
3.	(a)	21.	(d)
4.	(a)	22.	(a)
5.	(b)	23.	(d)
6.	(b)	24.	(a)
7.	(c)	25.	(b)
8.	(b)		
9.	(c)		
10.	(b)		
11.	(c)		
12.	(a)		
13.	(b)		
14.	(a)		
15.	(a)		
16.	(a)		
17.	(d)		
18.	(c)		

PHYSICS
PRACTICALS – CLASS XI
FOR VISUALLY IMPAIRED STUDENTS

Guidelines for Practical Question Paper

1. There will be a MCQ based examination in lieu of the conventional Practical examination, for the visually impaired students.
2. The MCQ's will be based on the basic practical aspects and the Simple theory of only the **ten** practicals listed in the **'Syllabus'** for these students.
3. The special examination will be of 30 marks distributed as follows:

   25 MCQ's of 1 mark each**: 25 marks**

   '**Viva'** , on the ten practicals listed in the syllabus: **05 marks**

   Total: 30 marks
4. The examination will be of 90 minutes duration which time will include the time for reading the question paper.
5. Candidates are not required to submit any record, or note book, at the time of this examination.
6. The MCQ's would be designed in broad accordance with the following considerations:
   (i) The MCQ's will check the student's familiarity, and basic understanding, of the construction, working and simple theory of the instruments/devices relevant to the experiments listed in the syllabus.
   (ii) The MCQ's would require the students to do only such quantitative calculations that can be done (almost) orally.
   (iii) The MCQ's based on, or related to, graphs would have the relevant data/details in such a form that makes it easy/straight forward to interpret the nature of the graph or to do the relevant calculations.
   (iv) The MCQ's can also be based on some familiar daily life situations/devices. These would be related with the basic construction/theory of the instruments/devices used in the listed experiments.
   (v) All the MCQ's would have four choices only ONE of which would be the correct/best choice.
7. Teachers will explain the basic details of the listed experiments to the students and help them develop the feeling of observation and interpretation through the 'other basic senses"
8. All the MCQ's, and the 'Viva' by the teachers, would be student friendly and in accordance with the special needs of these students.

Design & Blue Print

TIME: 90 minutes M.M.25

A. The 'Weightage', to the ten experiments, listed in the syllabus, would be as follows:

Expt. No.1 and 2	3 or 4 questions	3/ 4marks
Expt No.3 and 4	4 or 3 questions	4/3 marks

(The total number of questions, from the first 4 experiments would be 7, carrying a total of 7 marks)

Expt No. 5	3 questions	3 marks
Expt No. 6	3 questions	3 marks

Expt No. 7	3 questions	3 marks
Expt No. 8	3 questions	3 marks
Expt No. 9	3 questions	3 marks
Expt No. 10	3 questions	3 marks
Total:	**25 questions**	**25 marks**

B. The ' broad distribution' of the nature of MCQ's would be approximately as follows:
(This distribution is only suggestive in nature)

(i)	Construction/Apparatus Related:	4 questions	4 marks
(ii)	Working/Procedure Related :	5 questions	5 marks
(iii)	(Simple) theory related :	5 questions	5 marks
(iv)	(Simple) quantitative/calculation related:	5 questions	5 marks
(v)	Graph related/graph based:	3 questions	3 marks
(vi)	Daily- life related/concept based :	3 questions	3 marks
	Total:	**25 questions**	**25 marks**

C. All the MCQ's would have four choices only ONE of which would be the correct/best choice. The students would be required to identify this correct/best choice.

D. All MCQ's would be of 1 mark each.

BLUE PRINT

S.No.	Experiment No.	Nature of Question						Total
		Construction/Apparatus related	Working/Procedure related	(Simple) Theory related	Simple quantitative/Calculation related	Graph related/Based	Daily life related/Concept Based	
1	1,2	1	1		1		1	4
2	3,4	1	1				1	3
3	5	1		1	1			3
4	6	1	1		1			3
5	7					1+1	1	3
6	8		1	1	1			3
7	9		1	1+1				3
8	10			1	1	1		3
TOTAL		4	5	5	5	3	3	25

LIST OF PRACTICALS

1. To measure diameter of a small spherical/cylindrical body using vernier calipers.
2. To measure the internal diameter and depth of a given beaker/calorimeter using vernier calipers and hence find its volume.
3. To measure diameter of given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To determine the mass of a given object using a beam balance.
6. To find the weight of given body using the parallelogram law of vectors.
7. Using a simple pendulum plot L-T and L-T^2 graphs. Hence find the effective length of second's pendulum using appropriate length values.
8. To find the force constant of given helical spring by plotting a graph between load and extension.
9. (i) To study the relation between frequency and length of a given wire under constant tension using a sonometer.

   (ii) To study the relation between the length of a given wire and tension, for constant frequency, using a sonometer.
10. To find the speed of sound in air, at room temperature, using a resonance tube, by observing the two resonance positions.

SAMPLE MCQ PAPER
CLASS XI

Time: 1 ½ hours
MM: 25 marks

Q1. The least count, of a conventional laboratory vernier caliper, is 0.01 cm. If, in a given measurement, the main scale reading is 2.4 cm and the 5^{th} division of the vernier scale coincides with a main scale decision, the reading of the vernier caliper, is

(a) 2.35cm
(b) 2.40 cm
(c) 2.45cm
(d) 2.50cm

Q2. A Student uses a tuning fork of frequency n and observes the first resonance position, for a length l of the air column. The velocity of sound, in air, is then equal to

(a) nl
(b) 2nl
(c) 3nl
(d) 4nl

Q3. The diameter of a very thin wire is to be measured by finding the thickness of a collection of, say 10, of these wires. The instrument, that should preferred for this purpose, is a

(a) measuring tape
(b) vernier callipers
(c) screw gauge
(d) meter scale

Q4. The ratio of the spring constant of two springs, of the same material and diameter, is 2:3. If 100 grams mass on is suspended both the springs, the ratio of the extension in the two springs, would be

(c) 2:3
(d) 3:2
(c) 4:9
(d) 9:4

Q5. In the experiment, on finding the weight of a given body by the parallelogram law of vectors, the student needs to use

(a) Two pulleys and three weights in all
(b) Three pulleys and two weights in all
(c) Two pulleys and two weights in all
(d) Three pulleys and three weights in all

Q6. The sliding 'jaws' of a vernier calipers can be used for

(a) Measuring the depth of a beaker
(b) Measuring the length of a wire
(c) Measuring the internal diameter of a hollow cylinder
(d) Measuring the diameter of a sphere

Q7.In the experiment of a beam balance, a metallic bob is placed in one of the pan and it gets balanced by putting the weights 50g, 1g, 200mg and 1mg. The mass of the bob is

(a) 51.201g (b) 51.210g (c) 49.199g (d) 49.190g

Q8. In the sonometer experiment, the tension is made four time without changing the length. The frequency of the length of the vibrating wire, would

(a) remain same
(b) become two times in its earlier value
(c) reduce to half its (earlier) value
(d) become four times its (earlier) value

Q9. The first 'resonance position' in a resonance tube apparatus, is observed to be for a length of 720cm of its air column. The length of the air column for the second 'resonance position' in this sit up, would be nearly

(a) 30 cm (c) 50 cm

(b) 40 cm (d) 60 cm

Q10. The vernier scale of a microscope has 50 divisions. These coincide with 49 divisions on its main scale, which is graduated up to ½ of a mm. The least count of the vernier scale would be

(a) 1/50 mm (c) 49/50 mm

(b) 1/100 mm (d) 49/100 mm

Q11. In the experiment on finding the unknown weight, using the parallelogram law of vectors, the student should

(a) lubricate the pulleys and use a cotton thread

(b) lubricate the pulleys and use a woolen thread

(c) not lubricate the pulleys and use a cotton thread

(d) not lubricate the pulleys and use a woolen thread

Q12. The wire of a sonometer is made to vibrate by

(a) plucking it

(b) striking it with a hammer

(c) sliding a bow on it

(d) touching it with a vibrating tuning fork

Q13. A student measures the time period values (T) of a simple pendulum for, different values of its length (L). The graph between the 'L' and 'T' values, would be

(a) a straight line parallel to the 'length' axis

(b) a straight line parallel to the 'time' axis

(c) a straight line inclined to both the axis

(d) not a straight line but a curved line

Q14. A student observes that a tuning fork of frequency 256 Hz, shows resonance with a sonometer wire when the weight attached to the sonometer wire is W Kg and the length of the wire between the wedges is L cm. For observing resonance, with the same set up, with a tuning fork of frequency 512 Hz, the length between the wedges would need to be adjusted to

(a) L/4 (c) 2L

(b) L/2 (d) 4L

Q15. Given vernier calipers has a zero error of + 0.04 cm. The diameter of a rod, as read by this vernier, is 1.24cm. The corrected diameter of the rod is

(a) 1.20 cm (b) 1.20 mm (c) 1.28 mm (d) 1.28 cm

Q16. A carpenter, while driving a screw through a wooden block, of thickness 1 cm, observer that he has to rotate the screw 10 times for the purpose. The pitch of the screw is

(a) 1/100cm (c) 1 cm

(b) 1/10 cm (d) 10cm

Q17. The two arms of a defective physical balance have lengths a and b. ($a < b$). A metallic bob of mass m_1 is placed in the pan on the shorter arm and its gets balanced by putting a mass m_2 in the longer arm. We would then have

(a) $m_1a=m_2b$ (c) $m_1+m_2=a+b$

(b) $m_1b=m_2a$ (d) $m_2-m_1=b-a$

Q18. In the resonance tube apparatus set up, the first two resonance positions are observed for length l_1 and l_2 of the air column. A graph between l_1 and l_2 values, for different tuning forks, would be

(a) a straight line that, when produced, would (almost) pass through the origin.

(b) A straight line that, when produced, would not pass through the origin

(c) almost a parabolic curve

(d) an arbitrary curved line

Q19.7 The length of a given helical spring is observed to increase by 1 cm when a mass of 100 g is attached to its lower end. If g= $10m/s^2$, the force constant of the spring equals

(a) 1000 N/m (c) 10 Nm^{-1}

(b) 100 Nm^{-1} (d) 1 N/m

Q20. A student measures the time period (T) of a simple pendulum for different values of its Length (L) The student would get a straight line by plotting a graph between

(a) 'L' and 'T' values (c) L and $\sqrt{T}$ values

(b) '$\sqrt{L}$' and 'T' values (d) $\sqrt{L}$ and $\sqrt{T}$ values

Q21. Backlash error is usually associated with a

(a) meter scale (c) Screw Gauge

(b) Vernier caliper (d) Helical Spring

Q22. The minimum weights, available in the main 'weight box' and the 'fractional weight box', commonly used in the laboratory are, respectively

(a) 1g and 1mg (c) 10g and 1 mg

(b) 1mg and 1g (d) 10mg and 1g

Q23. In the experiment on finding the weight of a given body by the parallelogram law of vectors, a student observes that he can find the unknown weight by using two equal weights of 100 g each. The unknown weight is likely to have a value of (nearly)

(a) 500 g wt (c) 100$\sqrt{2}$ g wt

(b) 200 g wt (d) 100 g wt

Q24. The pendulum, in a wall clock, is a 'seconds pendulum', i.e., has a time period of 2s. The 'effective length' of a simple pendulum, that has the same time period, is nearly

(a) 50 cm (c) 150 cm

(b) 100 cm (d) 200 cm

Q25. The force constant, of a helical spring, is to be increased. For this, spring should be made

(a) strong and thick (c) soft and thick

(b) strong and thin (d) soft and thin

KEY

1. (c)
2. (d)
3. (c)
4. (b)
5. (a)
6. (d)
7. (a)
8. (b)
9. (d)
10. (b)
11. (a)
12. (a)
13. (d)
14. (b)
15. (a)
16. (b)
17. (a)
18. (a)
19. (b)
20. (b)
21. (c)
22. (a)
23. (c)
24. (b)
25. (a)

GUIDELINES FOR BIOLOGY PRACTICAL EXAMINATION FOR THE VISUALLY CHALLENGED STUDENTS.

1. The question paper will be based on MCQs.
2. There will be 25 questions in all.
3. The paper will carry 25 marks.
4. The duration of the paper will be 90 marks.
5. The paper will assess.
   - The ability through touch, small, learning, residual vision.
   - Familiarity with the apparatus required for various experimental set up.
6. Syllabus for the question will be the same as the list unit of practicals given in the course. **There will be atleast one question for each practical**.
7. Assessment of the of the practical skill will carry 30 marks and distributed as

(i)	25 MCQ	-	25 marks
(ii)	Practical file	-	03 marks
(iii)	Viva	-	02 marks

List of practicals for class XI will remain the same as given in the syllabus. However, keeping different abilities of the visually challenged candidates, the list may be divided under the following categories.

Few practicals suggested in the list need to be excluded.
Kindly refer the note attached to the practicals to help in framing the questions

The list of practicals of class XI identified in the syllabus can be divided under the following heads.

Specimens & Models

A-1 Study and describe three locally available common flowering plants from each of the following families (Solananceae, Fabaceae and Liliaceae) Types of root (tap or adventitious), stem (herbaceous/ woody) leaf arrangement / venation / simple or compound).
B- 1. Study parts of a compound microscope.
B-2. Study of the specimens and identification with reasons-Bacteria, Oscillatoria, Spirogyra, Rhizopus, Mushroom, Yeast, Liverwort, Moss, Fern, Pines, one monocotyledon and one dicotyledon and one lichen.
B-3 Study of specimens and identification with reasons-Amoeba, Hydra, Liverfluke, Ascaris, Leech, Earthworm, Prawn, Silkworm, Honeybee, Cockroach, Snail, Starfish, Shark, Rohu, Frog, Lizard, Pigeon and Rabbit.
B-5 Study of mitosis in onion root tip cells from permanent slides.
B-6 Study of different modifications in root, stem and leaves.
B-7 Study and identify different types of inflorescences.
B-10 To study human skeleton and different types of joints.

Note : The above can be done with the help of actual specimens / models / embossed diagrams.

Physiology experiments

A-3. Study of osmosis by potato osmometer.

A-7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials (e.g. wheat, potato, groundnut, milk or other such suitable materials)
A-9. To study the rate of respiration in flower buds and germinating seeds.
B-8. Study of imbibitions in seeds/ raisins.
B-9. Observation and comments on the experimental set up on:
(a) Anaerobic respiration
(b) Phototropism
(c) Apical bud removal

Note : When dealing with physiology experiments they can be done with the help of a peer with low / normal vision. These students can work in teams with peer groups who will follow the procedure and give them the observations and inference.

List of Excluded items:
A-2, 4, 5, 6, 8, 10, 11
B-4, 9(d)

BIOLOGY
Practicals class XI
A SAMPLE QUESTION PAPER
For Visually Impaired Students

Time 3 hrs M. Marks = 30

General instructions:

i) The question paper comprises of 25 questions , each question carries 1 mark.

ii) All are multiple choice questions with only one correct answer.

iii) Read the questions carefully and tick mark the correct/most appropriate answer.

iv) All questions are compulsory.

1. Monocotyledonous plants show which of the following feature:

a. leaves show reticulate venation.
b. Tap root system.
c. always perennial growth.
d. flowers are trimerous.

2. *Pinus* belongs to the group of plants which:

a. grow in tropical regions.
b. reproduce with the help of cones.
c. do not have any mycorrhizae.
d. annually growing plants.

3. Name of the characteristic which is true for *Spirogyra*

a. found in marine conditions.
b. parasitic in nature.
c. Colourless.
d. filamentous and spiral shaped chloroplast.

4. Compound microscope

a. has two lenses.
b. requires ultraviolet source of light.
c. used to view only dead organisms.
d. requires large room space.

5. Which characteristic is applicable for yeast

a. Multicellular.
b. has chlorophyll.
c. grows in sewage waters.
d. used in bakery industry.

6. Osmosis is the phenomenon where

a. water moves from its region of higher concentration to lower concentration.
b. water moves through a semi-permeable membrane.
c. occurs only in salt solution.
d. both 'a' and 'b' conditions apply.

7. To demonstrate osmosis which of the following options are important

a. Peeled raw potato.
b. Unpeeled raw potato.
c. Boiled peeled potato.
d. Boiled unpeeled potato .

8. Which one of the following options is essential to demonstrate aerobic respiration?
a. Dry seeds, KOH in air tight flask.
b. Germinating seeds, KOH in air tight flask.
c. Dry seeds, KOH in open flask.
d. Germinating seeds, KOH in open flask.

9. Which one of the following represent the characteristics of a shark

a. Ventral mouth, symmetrical tail.
b. Asymmetrical tail, operculum.
c. Operculum present and symmetrical tail.
d. Dorsal mouth, operculum absent.

10. The stage of mitosis in which spindle formation takes place and chromosomes lie on equatorial plate is

a. Telephase.
b. Anaphase.
c. Metaphase.
d. Interphase .

11. The stage of mitosis in which daughter chromosomes become V, J, L or I shaped, depending upon the position of centromere is

a. Prophase.
b. Telophase.
c. Anaphase.
d. Interphase.

12. The adventitious roots that arise from few nodes near the base of the aerial stem are known as

a. Prop roots.
b. Stilt roots.
c. Fasciculated roots.
d. Tuberous roots.

13. Rhizome is a modified stem because

a. it grows vertically upwards in the soil and it has fleshy leaves.
b. it has nodes and it has eyes which bears germinating buds.
c. it's stem in highly condensed and disc like.
d. it has nodes, internodes and has brown scaly leaves.

14. Which one of the following options is characteristic of racemose inflorescence?

a. main axis elongated and basipetal succession of flowers.
b. main axis terminates in a flower which are in acropetal succession.
c. main axis does not terminate into a flower and flowers show basipetal succession.
d. main axis is elongated, does not terminate into a flower and flowers are arranged in acropetal succession.

15. Which one of the following food items would you be confirming when you obtain a reddish orange colour by adding 2ml of millon's regent to 2 ml of food solution?

a. Starch.
b. Sucrose.
c. Fat.
d. Protein.

16. Ramesh took 2 ml of juice 'A' in a test tube and added 2 ml of Benedicts' solution to it. He obtained orange red precipitate on heating. The test confirmed presence of which of the following in juice A?

a. glucose.
b. starch.
c. protein.
d. fat.

17. The identifying features of carrot roots are :

a. Conical with small roots.
b. Conical without small roots.
c. Round with small roots.
d. Irregular with no roots.

18. To demonstrate imbibitions in gram the changes observed are :

a. The weight of gram seeds increase and surface become smooth.
b. The weight of gram seeds increase and their surface remain unchanged.
c. The weight of the seed and its surface remain unchanged.
d. The weight of the gram seeds remain unchanged and surface becomes wrinkled.

19. Given below is a list of Identifying features

i) body surface show distinctly marked segments or rings.
ii) body is divided into head, thorax and abdomen.
iii) show closed circulatory system.
iv) body show bilateral symmetry.

The characteristic that are shown by an earthworm are
a. i, ii, iii, iv
b. i, ii, iv
c. Only i, ii
d. i, iii, iv

20. Select the feature that is not present in a Asterias (star fish)

a. water vascular system.
b. endoskeleton of calcareous ossicles.
c. mouth on the ventral side.
d. a well developed excretory system.

21. Which of the following features in present in frog.

a. two pairs of limbs with 5 toes in each.
b. two pairs of limbs with 4 toes in each.
c. two pairs of limbs with 4 toes in hind limb are 5 toes in fore limb.
d. two pairs of limbs with 4 toes in fore limbs and 5 toes in hind limbs.

22. You are provided a model showing valvate aestivation. Which of the following steps would be required to change it into an imbricate aestivation

a. rearrange the edges of one petal completely in and all others remain unchange .
b. rearrange the edges of one petal completely in and one petal completely out and others remain unchanged.
c. rearrange the edges of one petal completely in, edges of the third petal completely out and of the 4^{th} petal in twisted arrangement.
d. rearrange one petal in twisted from and others remain unchanged.

23. The type of joint present between the humerus and pectoral girdle is

a. Hinge Joint.
b. Pivot joint.
c. Fibrous joint.
d. Ball and socket joint.

24. Which type of joint is present between two adjacent vertebrae?

a. Synovial joint.
b. Cartilaginous joint.
c. Fibrous joint.
d. Pivot joint.

25. Each Mitotic division ends with formation of
a. Two daughter cells.
b. Four daughter cells.
c. Eight daughter cells.
d. Sixteen daughter cells.

Answer		Skills tested
1.	d	K
2.	b	U
3.	d	K
4.	a	K/U
5.	d	K
6.	d	U
7.	a	U
8.	a	U
9.	b	K
10.	c	K
11.	c	K
12.	b	K
13.	d	U
14.	d	U
15.	d	K
16.	a	A
17.	a	K
18.	a	A
19.	d	U
20.	d	U
21.	d	U
22.	c	A
23.	d	U
24.	b	U
25.	a	K

Annexure D - University of Mumbai Circular on Psychology Education at T.Y.B.A Level

UNIVERSITY OF
MUMBAI
No.UG/133 of 2010

CIRCULAR:-

A reference is invited to the Guidelines relating to the Bachelor of Arts (B.A.) degree course vide Circular No.UG/407of 2007 dated 10th October, 2007 and the Principals of the affiliated colleges in Arts and the Professor-cum-Director. Institute of Distance and Open Learning are hereby informed that the recommendation made by the Board of Studies in Psychology at its meeting held on 29th January, 2010 has been accepted by the Academic Council at its meeting held on 3rd March, 2010 vide item No. 4.25 and that, in accordance therewith the guidelines for conducting Practical (Paper VIII-Practicals in Cognitive Processes and Psychological Testing) and the Practical examination for visually impaired students who pursue at the T.Y.B.A. Psychology as a Single Major subject to read as under and the same has been brought into force with effect from the academic year 2010-2011.

1. For the experiments in Psychology, the visually impaired students will use materials con veiled wherever possible into accessible formats (Braille, audio, e-copy, tactile). The help and support of Resource Centres for the Visually Impaired ,like the Xavier`s Resource Centre for the Visually Challenged (XRCVC) can be taken for converting the required materials.

2. The visually impaired students can take assistance of a writer-cum-helper for making observational recordings during practicals and practical examination wherever required. If the students and writer-cum-helper are of the same stream, too education a qualifications of writer should be one step below that of the students. This condition will not be applicable if they are of different streams.

3. The practical examination of the visually impaired students should be conducted in a separate room with suitable seating arrangement. A team of two external examiners will examine the students on the specified criteria (Instructions given to the Subjects and Conduct of the experiment = 25 marks; Viva = 10 marks; Short Written test based on the Basic of Experimentation and Statistics in Psychological

Research and Exercises in Psychological Testing -15 marks; and Written Report of the experiment conducted = 35 marks). If an experiment involves visual content to a large extent the students will be examined on it through viva, and not actual conduct of the experiment. The members of the committee for Psychology constituted under Section 32 (5) (a) of the Maharashtra Universities Act, 1994, after consultation with appropriate agencies /competent authorities on visual impairment, will specify the experiments in *the* syllabus which involve visual content to a large extent for the information of the visually impaired students and the examiners

4. The Internal Assessment marks out of 15 given by the concerned college will be added to obtain the total marks out of 100. The-students will be required to maintain the journal with reports of experiments in written or typed form, prepared with the help of a writer/scribe.

...21

-2

5.The visually impaired students will be given extra time of 1 hour and thus, their practical examination will be of 4 hours duration instead of the usual 3 hours.

The above guidelines with respect to extra time for practical examination, qualifications of the scribe/helper and providing alternative questions if there are visuals in the question paper are in accordance with the High Court Guidelines mentioned in Circular No.DWC/C. No.7/Writer/Facility/96-07/2951 dated 20th December, 2006 and the circular dated 3rd May, 2008 issued by the Controller of Examinations of the University of Mumbai regarding providing a writer to blind students and granting extra time.

MUMBAI-400 032
19*th* June, 2010

L. R. MANE
Offg. REGISTRAR

To,

The Principals of the affiliated colleges in Arts and the Professor-cum Director, Institute of Distance and Open Learning

A.C./4.25/3/Q3/2Q10

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No. UG/133-A of 2010, MUMBAI-400 032 19th June, 2010

Copy forwarded with compliments for information to:-

1) The Dean Faculty' of Arts,
2) The Chairman, Board of Studies in Psychology
3) The Controller of Examinations.
4) The Co-Ordinator, University Computerization Centre.

(D. N. Jadhav)
Ag. Deputy Registrar
(UG.PG Section)

Copy to .
The Director, Board of College and University Development the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the to the Vice-Chancellor, the Pro- Vice-Chancellor, the Registrar and fee Assistant Registrar, Administrative sub-center Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer *(2* copies). Record Section (5 copies), Publications Section (5 copies) the Deputy Registrar, Enrolment Eligibility *and* Migration Section (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Register (Accounts Section), Vidyanagari {2 copies), the Deputy Registrar, Affiliation Section C copies), the Professor-cum- Director, Institute of Distance and Open Learning (IDOL), (10 copies) the Direct™ University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell) the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection. The Assistant Registrar Constituent Colleges Unit (2 copies), BUCT (1 copy), the Deputy Account Unit V (1 copy), the In-charge Director. Centralize Computing Facility (1 copy), the Receptionist (1 copy), the Telephone Operator (1 copy) the Secretary MUASA (1 copy), the Superintendent, Post-Graduate Section (2 copies), the Superintendent. Thesis Section (2 copies)

Annexure E- HSC Circular on Science Education at XI Level

महाराष्ट्र राज्य माध्यमिक व उच्च माध्यमिक शिक्षण मंडळ,
भांबुर्डा, शिवाजीनगर, पुणे ४११००४

क्रमांक रा मं/परीक्षा-५/ ८८९२
पुणे - ४११००४
दिनांक : १८ नोव्हेंबर, २००८

प्रति,

(१) संचालक,
झेवियर रिसोर्स सेंटर फॉर व्हिजिअली चॅलेंज्ड,
सेंट झेवियर्स कॉलेज, ५, महापालिका मार्ग,
मुंबई ४००००१

(२) प्राचार्य,
डी जी रुपारेल कॉलेज ऑफ आर्टस्,कॉमर्स व सायन्स,
सेनापती बापट मार्ग, माटुंगा रोड स्टेशन समोर, माहिम,
मुंबई ४०००१६

विषय : अकरावी विज्ञान शाखेत पूर्ण दृष्टिहिन असलेल्या विद्यार्थ्यांच्या प्रवेश मान्यताबाबत मार्गदर्शन.

महोदय,

उपरोक्त विषयास अनुसरून कळविण्यात येते की, इयत्ता ११ वीमध्ये विज्ञान शाखेत प्रवेश घेतलेल्या दृष्टिहिन विद्यार्थ्यांची खास बाब म्हणून प्रात्यक्षिक परीक्षा मौखिक स्वरूपात घेण्यास परवानगी देण्यात येत आहे. मौखिक परीक्षेसाठी परीक्षकाने सर्वसाधारणपणे प्रात्यक्षिक परीक्षेच्या संदर्भात लिखित स्वरूपात प्रत्येकी २ गुणांचे १० प्रश्न (प्रत्येक पेपरचे ५ प्रश्न या प्रमाणे २ पेपरचे १० प्रश्न) याप्रमाणे परीक्षा घेऊन गुणदान करावे ही विनंती.

आपला विश्वासू,

सचिव,
राज्य मंडळ, पुणे

प्रत माहितीसाठी

विभागीय सचिव, मुंबई विभागीय मंडळ, मुंबई

Exam5c/24.p65

"Give me the opportunity to be equal, and the right to be different."

– Dr. Phil Hatlen

The Xavier's Resource Centre for the Visually Challenged
(XRCVC)
St. Xavier's College
5, Mahapalika Marg
Mumbai - 400 001
Tel.: +91-22-22623298 / 22626329
info@xrcvc.org | www.xrcvc.org