

Science Laboratories of St. Xavier's School, Doranda, Ranchi

The science laboratories (Physics, Biology & Chemistry) of St. Xavier's School, Doranda, Ranchi, were inaugurated by Rev. Fr. Ajit Kumar Xess, SJ, the Chairperson of the School on 3rd December 2020. These laboratories have been redesigned, upgraded and renovated scientifically to cater to the needs of students. These laboratories are much capable of providing with the underlying simplicity and beauty of the subject. It has been kept in mind in designing the labs to meet with advancement of technology which makes significant impact on the life of the students. Labs at SXD have been designed to understand and fulfill the needs of students with brilliance and creative minds. The laboratories have an immense potential in providing answers to the theoretically learned lessons. Highly equipped and furnished labs enhance the students' learning, understanding and testing the observed phenomenon of theoretically discussed lessons.



Physics Laboratory at SXD

Importance of Equipping Physics Laboratory:

Physics laboratory at SXD is a place where experiments of Physics are carried out. Physics is that branch of science where experimentation is an integral part of the core subject. As per Oxford Advance Learners dictionary definition Physics is *“the scientific study of matter and energy and the relationships between them, including the study of forces, heat, light, sound, electricity and the structure of atoms”*. One can see that Physics is a vast subject engulfing various disciplines in it and at school level a student is taught fundamentals of all these disciplines. In each of it there is multitude of experiments to be performed at school level. There is a wide range of physics laboratory equipment from the common ones like magnets, pulleys, pendulums, inclined planes, heat lamps, beakers, lenses, glasses, tuning forks, item scales etc. to sophisticated ones like spectrosopes, microscopes, electromagnets, voltammeter, potentiometer, etc.



Purpose or the importance of Physics Laboratory:

- A Physics lab aids a student in establishing the relevance of the theory. It brings clarity in the mind of the students regarding the basic concept of the subject.
- Students understand the difference between theory and application. Physics laboratory helps a student in improvising one's approach towards the subject.
- Experiments carried out in Physics laboratory help students in learning how to be patient and careful while taking observation and hitherto calculating inference.
- Research is everything in science without research science would get stagnated. It is here in Physics lab that a student learns what it is to be a researcher. What are the

attributes of a researcher which they need to inculcate? These questions hovering over students' mind get answered in a Physics educational lab.

- There are different procedures of different experiments in Physics and then there are some basic behavioural rules in a laboratory. A student of Physics needs to be aware of all these. And working in a school's physics laboratory actually puts a fundamental slab for them.

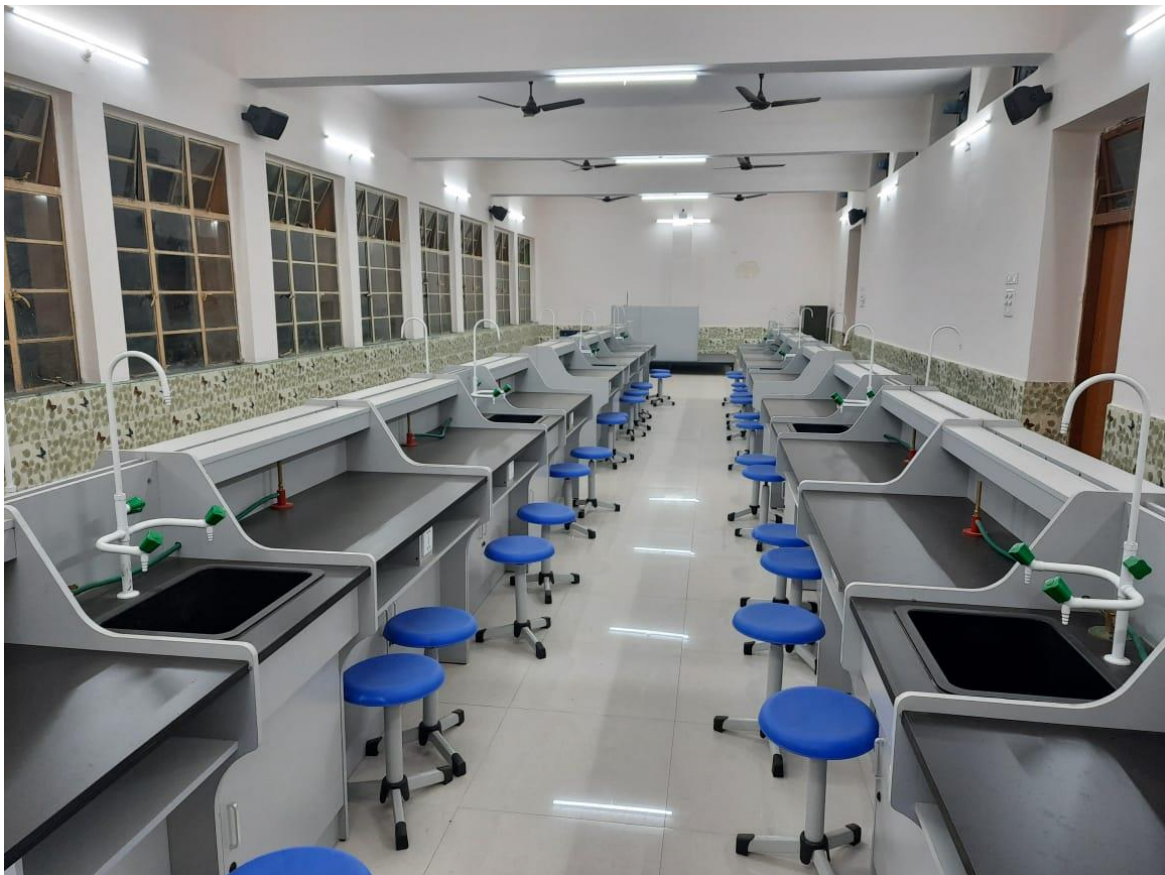
Function of a Physics laboratory:

Broadly the functions of Physics Laboratory are determined according to the needs of the students and science industry. Physics laboratory in the school has its crystal and clear function. The laboratory is aimed in enabling students to learn physics theories in a more elaborative manner with the involvement of its application. The experiments carried out are mostly the ones in coherence with the curriculum.

Biology Laboratory at SXD

QUEST FOR BIOLOGICAL KNOWLEDGE

"I hear and I forget. I see and I remember. I do and I understand." This saying helps to build a connection between theory and practical. Doing practical in the biology laboratory makes the theoretical knowledge of students an integral part of learning.



What happens in the Laboratory?

Laboratory work helps the students to focus on the verification of theoretical knowledge. Science educators and teachers agree that laboratory work is indispensable to the understanding of science. Laboratory works encourage the development of analytical and critical thinking skills of the students. Further, the students deepen their understanding of the topics when they do the practical in the laboratory. They understand the implication of the practical classes.

The significance of Biology laboratory work:

1. Supporting or strengthening theoretical knowledge.
2. Experiencing the pleasure of discovery and development of their psycho-motor skills.
3. Teaching how scientific knowledge can be used in daily life.
4. Increasing creative thinking skills.
5. Gaining in scientific working methods and higher order thinking skills.
6. Developing communication skills.
7. Developing manual dexterity by using tools and equipment.
8. Allowing students to apply skills instead of memorizing.

Practical study in Biology encompasses three instruction styles - **Discovery** (guided-inquiry), **Inquiry** (open-inquiry) and **Problem-based**. Biology lab work helps students in verifying theories and principles already taught in theory. For example, “to measure the rate of transpiration by using Ganong’s Potometer, morphological and anatomical study of body parts as well as parts of the plant.” It helps to go hand-in-hand with the laboratory techniques and use of laboratory equipment such as the microscope which is an indispensable tool in Biology. A student who doesn’t know how to use a microscope cannot implement most of the biological experiments. Biology lessons comprise of many abstract concepts such as enzymes, DNA, chromosomes, etc. These concepts are concretized through laboratory works.

An interesting laboratory work applied before starting a new topic, motivates the students and enhances their learning through experiments in the laboratory. During laboratory work students learn both the process of experiments and how to function as a team and work together. Practical work provides students with the skill to solve a scientific problem they may encounter, by doing and experiencing, such as monitoring the process of plasmolysis, effect of different CO₂ concentration on the rate of photosynthesis. Most importantly, students gain in establishing associations between scientific knowledge and daily life which helps them in better understanding of heart diseases, digestive problems, eye defects, tooth decay, etc. Laboratory work helps developing a positive attitude, critical thinking, logical skills and above all establishing a strong bond between science, technology and society.

Laboratory activities provide students with opportunities for questioning, observing, sampling, handling & working of equipments, and experiment with scientific phenomena in their quest for knowledge of living things. It serves as an effective means for comprehension, understanding and application of biological knowledge.

Chemistry Laboratory at SXD

What is Chemistry?

Chemistry is an excellent science, as it teaches that all matters are made up of chemicals. Chemistry is important because everything we do is chemistry. Even our body is made of several chemicals. Chemical reactions occur when we breathe, sleep, play or sit for doing anything. All matter is made up of chemicals. Students who make up their minds to become chemists, physicists, doctors, nurses, pharmacists, geologists, nutritionists etc., all study chemistry because most of the jobs are chemistry-related and high paying. So, importance of chemistry will remain a promising career-path.



Importance of Chemistry Practical:

Practical science activities have huge significance in the learning process. Chemistry practical work encourages self-learning and promotes experimental practices. It familiarises students handling of equipment, apparatus and tools that one needs in performing experiments. Practical works help in acquiring scientific knowledge and scientific outlook. Chemistry practical activities have large significance in the learning process. They engage students helping them develop important skills, understand the process of scientific investigations and develop a broad understanding of chemical concept. Chemistry practical is the acquisition of an understanding of hazard, risk and safe working. Chemistry practical work has clear benefits, helping students acquire the essential skills that not only gives a fluid transition to higher studies but opens the doors to science as a profession. It gives them practical skills and attitudes that will be valuable in the future career.

In chemistry, each chemical reaction has a special process, procedure and technique involved in it, on avoiding which no correct product or result is obtained. For example, in using a heating device like lighting up a Bunsen burner, one should be well practiced in making the gas mixture rich or poorer to play reducing flame or oxidizing flame successfully. It makes students learn that the nozzle of the blow-pipe some 1.2 c.m. above the head of the burner and in the middle of the zone of the luminous flame which on blowing hard (i.e. on addition of plenty of air) a non-luminous flame (called oxidising flame) is projected on the substance to convert it into its oxide form at some 980 °C. On the other hand, the nozzle when placed just outside the luminous flame, some 1.5 c.m. above the head of the burner and blown gently so that the yellow flame plays on to the substance, the latter is reduced to its metallic stage as some 440-500 °C. So the above example of the chemical reaction illustrates that using two different techniques, two quite different products are formed. Another example of titrimetric operations, a vertical clamping of burette, in the middle of its length and no clamping at the lower or upper extremity, avoiding parallax-error to the liquid meniscus, gives quite correct reading. While releasing a liquid 'drop-wise' to make the meniscus reach as the index-point, 'fore-finger' and not the thumb should be used because the fore finger is more sensitive in applying requisite pressure on the mouth of the pipette.

Taking the case of solubility of a substance, a student learns a common principle of dissolution that 'like dissolves like'. An ionic or polar substance like sodium chloride, potassium nitrate, ethyl alcohol etc., dissolve readily in a polar solvent like water whereas a non-polar or covalently bonded compound like benzene, toluene, carbon tetrachloride, kerosene oil, petrol, vegetable oil etc., would not dissolve in water.

While using acids, students take it into a careful practice that concentrated acids are added into water but water is never added into such acids, because the latter operation causes explosion and hazards. Hot and concentrated acids must not be added into water, which also cause vigorous explosion. Hot and concentrated acid must be cooled first, as the room-temperature and then only be added slowly to water for a safe working. While heating a substance with a concentrated acid, an optimum amount of acid should be used and heated gently in a hard glass test tube (like Borosil make) and never in an ordinary test tube, because boiling temperature of a concentrated acid rises above 350 °C, at which an ordinary test tube may crack down and cause serious accidents.

When a solid substance is to be heated in an experiment, the mouth of the test tube should be kept inclined below because water of crystallisation present in the solid substance, on heating turns into vapour phase, condenses down in the cooler part of the test tube and finally trickles down, making no damage to the experiment or apparatus.

Students get acquainted with the evolution of many poisonous gases evolved during the chemical reactions. They become much careful to protect themselves from these poisonous effects. Most of the chemicals are poisonous to human body. Chemical practical teaches their safe experimentation, their careful usage and makes students well familiar with their antidotes.

The above are only a few of the techniques, procedure and precaution etc. There are numerous such interesting steps, which one learns from Chemistry Practical.