


# AScientia<sup>®</sup>

Passion to make it happen!



**In this issue:**  
Our New Veterinary Science Option

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 **AScientia** > A combination of the word 'ASc' (the acronym for Temasek Applied Science School) and the Latin word 'scientia' (which means knowledge, science or skill.)

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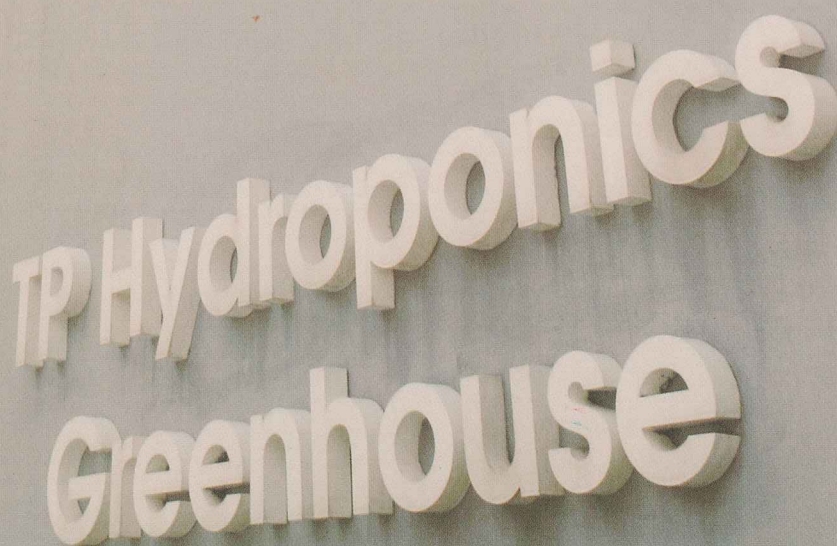
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ISSUE 1: Events from Jan - Sep 2004

The editors would like to extend their appreciation to all who have contributed to the writing of this issue.

The TP Hydroponics Greenhouse, officially launched on 21 Feb 2000, is probably one of ASc's most pleasant learning environments where students learn while surrounded by nature. The greenhouse is used for both teaching and research purposes and is truly a 'living classroom'.



TP Hydroponics  
Greenhouse

Design and additional photography by **ferret**

## Full-time Courses Offered by ASc

### Diploma in Applied Food Science & Nutrition

This course provides scientific training in food science and nutrition. You can later choose to specialise in the areas of nutrition, food science or foodservice. Nutrition electives will equip you with knowledge and skills for application in various community and healthcare settings. Food science electives offer subjects which are relevant to the food industry. Students keen on the foodservice electives will gain a holistic training in the operation and management of the foodservice business.

### Diploma in Biomedical Science

This course is well suited to students who are interested in pursuing careers in the biomedical and healthcare industries. It offers three specialisation options - the Biomedical Technology option, the Pharmaceutical Science option and the Pharmaceutical Science option. You will acquire competence in Biomedical Science through practice-oriented training, internship programmes in biomedical science industries and applied research activities led by TP's experienced and professional teaching staff.

### Diploma in Biotechnology

The course is designed to meet the demands of the growing life sciences industry. The broad-based training programmes with strong emphasis on the fundamentals and applied sciences in cell and molecular biotechnology will enable you to cope with the demands of the continuous development in both the biotechnology and biomedical science industries. Student internship programmes and applied research activities led by our professional staff will further help equip you with relevant technical knowledge and skills. You will also be trained in thinking and communication skills to prepare you to be competent technologists in the workforce upon graduation.

### Diploma in Chemical Engineering

This course is designed to provide skilled manpower for the chemical industries. It equips students with knowledge and skills in process technology, occupational safety and health, analytical chemistry and process engineering principles for application in the relevant industries.

The course emphasises process engineering, chemistry, and laboratory techniques with practical knowledge of chemical process technology, petrochemical technology and semiconductor technology. Practical knowledge of process control and laboratory techniques as required by the relevant industries is also included.

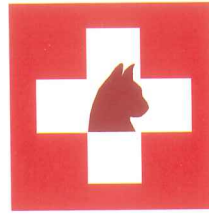
### Diploma in Consumer Science & Technology

Launched jointly by the Ministry of Education (MOE) and the National Institute of Education (NIE), the Diploma in Consumer Science & Technology (CST) is one of two diplomas that graduates will obtain after a four-year training programme under MOE's Home Economics Teacher Training Scheme. The other, the Diploma in Home Economics Education, is awarded by NIE and will prepare CST graduates to become competent Home Economics teachers by training them in effective pedagogy.

An inter-disciplinary approach to training equips students with scientific knowledge and technical skills related to Food Science and Nutrition, as well as creative skills in textile and design.



# Veterinary Science Option - A Polytechnic First



August 2004 saw the graduation of ASc's first batch of students from the Veterinary Science Option (Vet Sci Option) of the Diploma in Biotechnology. Their graduation is significant as Temasek Polytechnic is currently the only polytechnic to offer this option which provides specialised training in skills for working with animals; either in research institutes or veterinary clinics.

With a strong industry demand for such graduates, the first batch of 19 graduates has had no problems finding jobs where they can put their skills to good use. The majority of them have found jobs or pursued studies in a field related to their studies. Feedback from employers has also been encouraging and supportive, with some companies (e.g. Biopolis) specifically aiming to recruit graduates from this option.

To develop a rigorous curriculum which would meet the needs of the industry, ASc consulted relevant practitioners in the fields of

laboratory animal science and veterinary diagnostics. Feedback from market survey was also obtained to further enhance the relevance and currency of the curriculum.

In this Vet Sci Option, students are trained to be competent animal technologists for research and animal care at research organisations. The course also prepares them to be competent veterinary technologists for veterinary organisations, veterinary clinics and the AVA. With this training, students could also serve as veterinary resource personnel at pet-related companies.

ASc is currently in discussion with several Australian universities to get subject exemption from their veterinary science degree programme for our Vet Sci Option graduates. ASc is also seeking project collaboration with the AVA, animal welfare organisations and research organisations.

## Fast Facts about ASC's new Vet Sci Option

- Specialised modules offered: Animal Care & Husbandry, Animal Health & Diseases and Surgical & Anaesthetic Principles
- Customised Facilities for training - Animal Facility with Surgery and Preparation Room, Procedure Room, Animal Holding Unit, Necropsy Area and Aquaculture Facility
- Complementary Workshops - Responsible Animal Care & Use Workshop, Animal Behaviour Management Workshop
- Related Student Internship Programme - 20-week attachment to veterinary organisations and those which involve laboratory animal science

## Our Vet Sci graduates finding their niche ↓

### CALVINA KEK HUILING

Laboratory Technologist at the Institute of Molecular and Cell Biology (IMCB)



*"As I'm working on various mice strains as an experimental model, the Vet Sci modules all come in very handy, e.g. animal restraint, identifying their sexes, husbandry, disease etc. All the Vet Sci modules were conducted by very good and experienced lecturers. The practicals and lectures were lively and very interesting."*

### CHONG SHU HONG

Veterinary Assistant at Allpets and Aqualife Clinic



*"The job is fun. I gain a lot of experiences that might be useful for my further studies. Working with animals is great. My favourite subjects were Anaesthesia and Surgical Practice, Animal Health and Diseases and Animal Care and Husbandry. They are also the subjects which are most relevant to my current job."*

### TANIA CHIA

Scientific Officer at MediLynk, a subsidiary of Lynk Biotechnologies



*"It has been a life-enriching experience studying in TP, especially in the Vet Sci option. With the increasing popularity of pets and the use of animal models for research, I believe the skills we've learnt are relevant. In the Vet Sci Option, blood collection techniques, animal handling and restraint were emphasized. This gave me confidence in carrying out animal experimentation as humanely as possible."*

### NICOLE ANN LIM

First polytechnic graduate to be accepted into the Veterinary Science Degree programme



Nicole has been offered admission to the University of Sydney, University of Melbourne and Massey University, which usually take in G.C.E. 'A' Level holders into their Veterinary Science degree programmes.

## ASc's Hydroponic Orchid Growth System Used in Field Production

ASc's new Hydroponic Orchid Growth System has received positive industry support with licence agreements being signed to use the innovative growth system in actual field production of orchids. The licence agreements are the culmination of a three-year project undertaken in collaboration with the AVA which was completed at the end of Dec 2003.

TP, with the AVA, co-hosted a Growers' Seminar for the orchid grower clusters on 24 Sep 2003 to introduce the growth technology developed

by Dr Atomic Leow of the Applied Science School to orchid growers.

With the interest generated at the seminar, a detailed briefing cum visit to the TP Hydroponic Greenhouse to view the growth system was organised for 4 shortlisted orchid growers in Nov 2003. Following further discussions and meetings, licence agreements were signed with Orchidville, a major orchid grower and Lynk Biotechnologies, a biotechnology research company.



*Mr. Joseph Phua (CEO, Orchidville Pte Ltd.) admiring the orchids at the TP Hydroponic Greenhouse raised by the Precise Influx and Rapid Drain System invented by TP ASc*



*Mr. Joseph Phua (CEO, Orchidville Pte Ltd.) entering into licence agreement with TP ASc*



# Encouraging Innovation and Entrepreneurship

Here are some of the events and projects that ASc has embarked on to encourage innovation and entrepreneurship amongst our students:

## Lynking Lab Benches to Production Floors

31 Jan 2004

A talk on entrepreneurship in the Life Sciences presented by Professor Lee Chee Wee of Lynk Biotechnologies, the company famous for products such as Biolyn Hair Serum and MediLynk Transdermal Glucosamine cream



← Prof Lee with Mrs Soon, Director / ASc

### Highlights:

- Prof Lee spoke to a full-capacity crowd of ASc students and staff about the challenges and constraints faced by entrepreneurs.
- Participants were given real-life examples of Prof Lee's own experiences in entrepreneurship.



*"It sounds quite hard to be an entrepreneur actually. You really have to dare to do it. But he made me feel that it's exciting to be an entrepreneur in the Life Sciences, where new discoveries are being made."*

Level 2 student participant

## Ice Cream Innovation

Dec 2003 - Apr 2004

An interdisciplinary project involving students from ASc collaborating with students from Temasek Business and Design Schools to explore the possibility of commercializing ASc's innovative Green Tea Frozen Dessert

### Highlights:

- The Green Tea Frozen Dessert, developed by Applied Food Science & Nutrition students working on a final year project, is low in fat and contains no added sugar.
- A total of 43 students from the 3 schools were involved.
- A business proposal was submitted to the Lee Kuan Yew Global Business Plan Competition under the project title "Indulgence Wellness Pte Ltd - the Creators of Innovative Ice Cream".



## Hawking Heliconia House to House May - Jun 2004



*Heliconia psittacorum* L.f. x *H. spathocircinata* Aristeguieta cv. Golden Torch

*Heliconia latispatha* Bentham cv. Distans

*Heliconia* x *nickeriensis* Maas & deRoosj (*H. psittacorum* x *H. marginata*)

*“It was an eye-opening experience and I really learnt more about selling and marketing. It was a great experience getting my first successful sale. It’s something I wouldn’t get to learn if I just stuck to my coursework.”*

Student participant

A direct-selling experience for 29 students who learned first hand about the triumphs and travails of salesmanship as they went from house to house selling heliconia plants grown by ASC

### Highlights:

- The heliconia plants are the result of an A\*STAR funded Heliconia R&D project conducted by researchers at ASC in collaboration with the Jurong Bird Park.
- The direct sales of the plants would help ASC assess the commercial viability of the heliconia plants developed.
- Students attended training on the heliconias by the Horticultural curator from Jurong Bird Park and research scientists from ASC as well as training on direct-selling techniques by the manager of Temasek Polytechnic’s Entrepreneurial Centre.
- Students received positive responses to the 3 varieties of heliconia sold.
- The total profits will be channelled to student-related activities organised by the ASC Studies Club.

## Innovation Competition for Charity

Aug 2004



Preparing the “rendang” hotdog

A competition for all freshmen who were required to come up with innovative products and marketing strategies to raise funds for needy students on Campus Care Network Day

### Highlights:

- All freshmen attended an introductory innovation workshop where they were taught about the importance of innovation and tried out creative thinking tools.
- The winning products included “rendang” hotdogs, personalised gift tags, gel test tube gifts and even a haunted house.



Personalised gift tag



# Equipping for Excellence

Here we showcase some of the training programmes ASc students have undergone and the achievements they have made.

## First MP Symposium

The inaugural Major Project (MP) Symposium on 29 & 30 Apr 2004 showcased 14 best projects done by the students from the various diplomas. The students presented their projects and stood up to rigorous questioning by a panel of judges. Students who excelled were awarded a Distinction grade for their projects and the best candidate received the School Project Prize.

The winning project submitted by Lee Kian Hong, from the Diploma in

Biotechnology was entitled “The Study of Novel Bacterial Blight Resistance gene Xa27(t) from *Oryzae Minuta*, which contains an efficient promoter that up regulates transcription and encodes for cytoplasmic R protein”. This project was undertaken at Temasek Life Sciences Laboratory, under the supervision of its staff Dr Yin Zhong Chao and Dr Gu Ke Yu, where Kian Hong worked while on his Student Internship Programme (SIP).



*Kian Hong (centre) with his supervisors*

## Baxter Bestows a Bonus

While attached to the Singapore branch of Baxter Healthcare SA as an intern, Quek Chwan Shin, a student from the Diploma in Biomedical science, was commended for his “committed and valuable contribution to the company during his 6 month attachment”. He was given \$500 as a discretionary bonus that Baxter gives to students who show outstanding performance in their attachment.

Complimented by his supervisor as being someone who “possesses a

keenness to learn; the initiative to acquire new knowledge; and is always helpful and friendly to people working with him”, Chwan Shin certainly showed he took his SIP experience seriously. His supervisor also found that he was able to relate the knowledge he gained in school to the final year project he was working on.

Chwan Shin said he found his SIP in Baxter “challenging” and said that “knowledge-wise, I have gained much.”

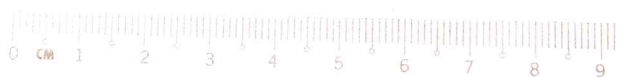


*Chwan Shin (last row in white) with his colleagues from Baxter*

## Crystal Growing Competition – ASc bags prize again with Candour

Students from the Diploma in Biomedical Science were 2nd runners up in the open category of the Singapore National Crystal Growing Challenge, organised by the Department of Chemistry, NUS, and the Singapore National Institute of Chemistry from 2 to 4 Sep 2004.

In Sep 2002, ASc's students won the Meritorious Award in the Senior Category with their 23 cm-long potassium dihydrogen phosphate (KDP) crystal. This year, our students managed to grow the 3rd longest Nickel (II) Sulphate Crystal in the open category. Kudos to another winning effort.



The winning crystal – "Candour on Rochelle Salt" shown in actual size

### Significant Figures:

- 8 - the number of students who took part in the competition
- 5.4 cm - the length of the winning crystal
- 24.81 g - the weight of the winning crystal

## Chemical Process Technology Centre Up Close

ASc takes great pains to help students relate the concepts and theories they learn to what actually takes place in the workplace and industry. Students from the Diploma in Chemical Engineering, have their theoretical knowledge reinforced through sessions in our school's pilot plants in the laboratories and also through plant visits. But there are still some experiences which are impossible to replicate in school - working in a real life process plant for example.

Now, through attachment to the Chemical Process Technology Centre (CPTC), students can finally see how each segment they had previously learnt about fits together into a real live process plant producing chemicals. Students spend

their first 4 weeks at CPTC attending lectures and practical sessions. Following that, they work on 12 hour shifts and get hands-on experience in starting-up and shutting-down the process plant. Finally, the attachment ends with the students making a presentation on their projects and learning experiences in the sixth week.

While students found the experience challenging and sometimes tiring, more than 80% of the students indicated that they enjoyed the shift training thoroughly. One student pointed out that the attachment gave him "good exposure to a real plant" and provided the opportunity to "have hands-on experience with the equipment".

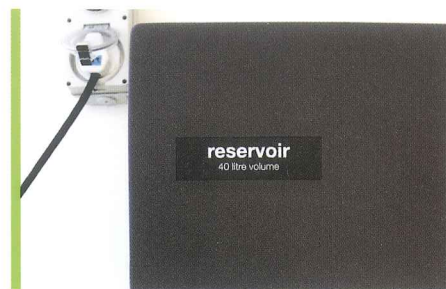


*"Training at CPTC adds value to the training our students receive in school and helps to ensure their quick and effective integration into the workforce."*

Lena Sim, SIP coordinator

## Applying our WITS to Water Conservation

As a science school, ASc uses a large quantity of de-ionized (DI) water in its practical lessons and applied research. In the production of DI water, a large amount of wastewater (RO discharge) is drained into the sewer. Concerned about this wastage, a team of lecturers and technical support staff formed a Work Improvement Team (WIT) to find ways to solve this challenging problem.



**The Problem:** An estimated 875 m<sup>3</sup> of RO discharge (about 1/3 the volume of a competition-size swimming pool) is thrown away annually.

**The Solution:**

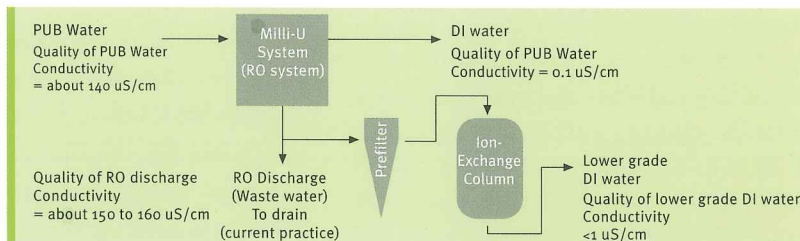
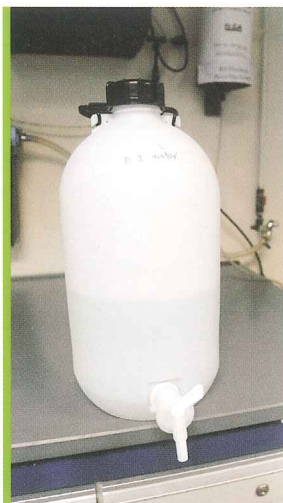
- View the discharge as a commodity rather than waste and find a way to reuse it
- Channel the RO discharge as feed for an ion-exchanger to produce grade 3 DI water in the Organic Chemistry laboratory
- Use the grade 3 DI water for experiments in which a lower grade of DI water is acceptable

**The Result:**

- Almost 100% of RO discharge produced in the Chemistry laboratory can be reused through the new ion-exchanger system
- The new system produces consistent grade 3 DI water, comparable to the grade 3 DI water produced using PUB water
- The grade 3 DI water produced was used for applied research experiments without any undesirable effects
- Overall cost savings is projected at \$2,500 a year
- Time is saved in preparation of DI water for practicals since the ion-exchanger acts as auxiliary DI production units, enabling more DI water to be supplied in a shorter time

ASc is now considering using this new method for another four RO systems in the school.

### Treatment Strategy for the Reuse of RO discharge as a Lower Grade DI water





Taking part in a hands-on decontamination exercise

## Biosafety Workshop

In line with Temasek Polytechnic's commitment toward lifelong learning, ASc organised a Biosafety Workshop on the Management of Biohazardous Materials. Offered as a Life Sciences Extension Programme under the umbrella of the Continuing Education Centre, the one-day workshop sought to promote biosafety awareness in biological, clinical and research laboratories.

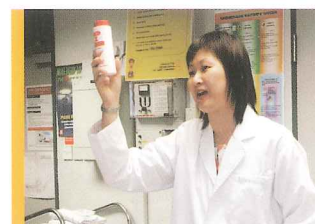
The workshop, which was held on 24 Feb 2004, was attended by laboratory professionals from various organisations, including national agencies such as the Health Sciences Authority, Singapore Civil Defence Force, National Environment Agency and institutions such as the NUS, NTU and hospitals. Participants learnt the principles of managing biohazardous materials through sessions conducted by guest speakers. The three sessions were

- Safety Considerations in Laboratory Facility and Design, by Dr Derrick Tan of 1st Phase Operations;

- Biosafety Management by Dr Ng Lee Ching of DSO National Laboratories and
- Transportation of Biological Materials & Risk Assessment by Dr Viji Vijayan of Singapore Health Services.

Participants then applied their knowledge to the discussion of a case study on risk assessment which was conducted using the PBL (problem-based learning) approach and facilitated by lecturers of ASc. They also had the opportunity to try their hand at some practical applications of decontamination. As part of the workshop, participants also received a custom-packed Emergency Biological Response Kit.

Feedback from the participants was very positive with quite a number of participants indicating that they enjoyed the hands-on decontamination exercise and the risk assessment session. Participants also mentioned that the three sessions conducted by the various guest speakers complemented each other well.



Mrs Lim-Ng Lay Tin, Catherine of ASc showing participants the contents of the Emergency Biological Response Kit which was given out to every participant



Ms Chew Lay Leng (standing) of ASc facilitating a discussion on risk management



Guest speaker Dr Derrick Tan (right) giving out certificates to participants

## Temasek Polytechnic Exploration And Mentorship In Science (TEAMS 2003/2004)



Projects students worked on under the guidance of ASc lecturers (Oct 2003 - Jan 2004):

- Liquid Waste Treatment Using Membrane Technology
- Medicinal Effect of Fruit Juice Concentrate on Growth of Bacteria
- Chemical & Biological Studies on Chinese Herbal Plants
- Physical chemical Properties of Low-Fat Sugar-Free Healthy Ice Cream



Who says one has to be a scientist or undergraduate to pursue scientific investigations that could change the world? Temasek Applied Science School (ASc) now challenges secondary school students to embark on progressive research to develop skills essential for scientific enquiry while discovering the fascinating world of science!

Launched on 29 Oct 2003, the new TEAMS programme saw 17 students from 9 schools embarking on an 80-hour journey that would give them greater insights into the world of research. To make full use of their holidays, several groups started immediately after an initial briefing and introduction of mentees to their mentors.

Students valued this learning experience as it gave them wide exposure to scientific research

through the use of apparatus and techniques neither found nor demonstrated at the secondary school level. Furthermore, the requirement to submit a project report at the end of the programme gave the students knowledge of how scientific information is meticulously documented according to the expectations of the scientific community.

The mentors were encouraged by the enthusiasm and responsibility of the students under their charge. The teacher supervisors were also pleased with the extent of learning that their students had acquired. The success of this first run of the TEAMS prompted organisers to commence a similar programme in Oct 2004.

### What students and teachers had to say about TEAMS:

*"I would recommend TEAMS to my friends because it opens up to us the world of research. By following the work of a researcher, I got to understand what researching is like."*

Myra Tan, student from Tanjong Katong Girls' School

*"It has been worthwhile. The methods and apparatus used are new and unique to me. I wouldn't have the chance to experience this anywhere else."*

Mark Ortega, student from Ngee Ann Secondary School

*"My student Eileen Yeo has become more motivated to put in her best in her studies and her heightened awareness in the life sciences has enabled her to achieve better in school."*

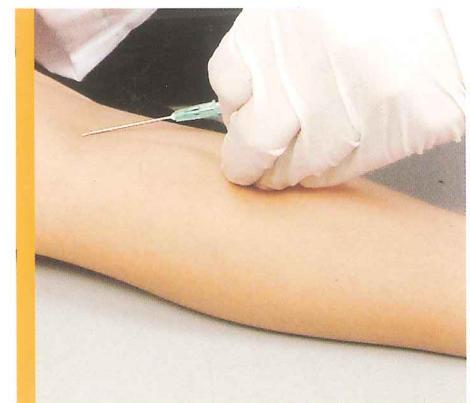
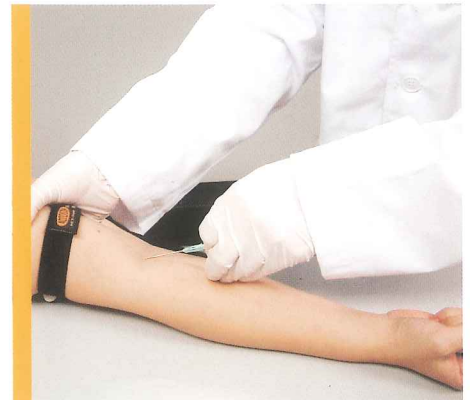
Mrs Lim Siew Luan, teacher from Pasir Ris Crest Secondary School

## Phlebotomy Skills for Professionals

A recently completed course for working professionals jointly offered by ASc and Singapore General Hospital (SGH) was the Skills Certificate in Phlebotomy. It is testimony of how educational institutes and the industry can work hand in hand to encourage continuous learning among working professionals.

The course ended in Sep 2004 and was attended by adult learners, many of whom were health professionals sponsored by healthcare organisations such as Thomson Medical Centre and Raffles Medical Group. The participants received training in phlebotomy skills and techniques in obtaining blood specimens as well as the safety procedures involved in protecting themselves and other parties from injury.

Theoretical training was carried out over 8 Saturdays in Temasek Polytechnic. Almost all the participants found the theoretical training beneficial, with one even commenting that “the facilities at the poly are the best and lecturers are helpful”. This theoretical training was then applied to real life in 30 hours worth of clinical training sessions done at satellite laboratories and polyclinic laboratories managed by the Department of Pathology, Singapore General Hospital. The practical sessions were a hit with the participants with most of them listing it as their favourite feature of the course. One participant highlighted that what she found most useful were the venipuncture and skin puncture procedures which were very relevant and useful. Having successfully completed the first run, ASc looks to continue offering such training with SGH.





## Part-Time Diplomas Being Offered

→ Continuous learning is becoming a way of life in fast-paced Singapore. As more working adults recognise the need to upgrade and obtain certification for their skills, there is a growing need for targeted courses to be provided by educational institutions.

Temasek Applied Science School (ASc) is offering two diploma courses to meet the needs of working professionals in the field of applied science. These two courses are in the areas of Chemical Engineering and Pharmaceutical Science.

## Part-time Diploma in Technology (Chemical)

### Course Overview

This course provides participants with relevant knowledge and laboratory techniques in process engineering, chemistry, occupational safety and health to support the continued growth of the chemical, petrochemical and pharmaceutical industries. It focuses on the fundamentals of chemistry and process engineering principles for application in the relevant industries.

The main objective of this course is to upgrade the technical knowledge and skills of adult workers in the chemical and chemical-related industries.

### Career Opportunities:

Graduates may work in the chemical/ petrochemical industries, environmental management and pharmaceutical companies as well as government agencies.

### Target Participants:

Supervisors and process technicians from the chemical and chemical-related industries and organisations.

Duration: 3 years (Flexible Delivery System)

Most recent Intake: Jun 2004

### Current Student Profile:

Employees of the Singapore Civil Defence, Exxon Mobil Chemical and Chevron, etc.

NEW!

## Part-time Diploma in Technology (Pharmaceutical Science)

### Course Overview

This course provides participants with relevant technical knowledge and skills in pharmaceutical analysis, pharmacology, good dispensing practice and pharmacotherapy, pharmaceutical microbiology and pharmaceutical legislation & marketing. It will also equip them with fundamental life sciences knowledge and skills in Cell Biology, Immunology, Microbiology, Anatomy & Physiology and Organic Chemistry to support the continuous growth in the area of biomedical and healthcare industries.

### Target Participants:

- Pharmacy assistants/technicians in hospital, polyclinics and retail pharmacies
- Pharmaceutical sales representatives
- Sales personnel in health food stores
- Technicians in pharmaceutical manufacturing & quality assurance
- Research personnel in pharmaceutical research and development
- ITE graduates with relevant certificates and work experience

**Duration:** 3 years (Flexible Delivery System)

**First Intake:** Mid-year 2005

Please contact the Continuing Education Centre in Temasek Polytechnic for more information:

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