

SciTalk

ISSN 1323-7667

Number 1 – February 2012

2012 is the Year of Sustainable Energy for All

The UN has declared 2012 to be the International Year of Sustainable Energy for All (SEFA). It is hoped that the SEFA campaign will enable access globally to energy, improved efficiency and enhanced deployment of renewable sources.

Energy is something many people take for granted in our society. However, more than 1.4 billion people worldwide have no access to electricity and 1 billion more only have intermittent access. Some 2.5 billion people – more than one-third of humanity – rely on traditional biomass for cooking and heating.

Both development and poverty alleviation are dependent on the supply of energy. The lack of modern energy services hampers the provision of many basic services such as human health. Access to energy can raise living standards, e.g. sustainable energy provides power to community health clinics, refrigerators to store medicines, and cell phones to get advice or help. Energy provides lighting so children can study after dark. In addition, smoke from polluting and inefficient cooking, lighting, and heating devices kills nearly two million women and young children prematurely every year and causes a range of chronic illnesses and other health impacts. Black carbon emissions from these devices worsen global climate change and foraging for fuel contributes to deforestation. Sustainable energy would provide people with respite from excessive labour, as it would reduce the time and drudgery of collecting fuel wood, while supporting cleaner, more efficient cooking options.

Be it food production, security, climate change, jobs or increasing incomes, access to clean, affordable, sustainable energy for all is essential for strengthening economies, fostering lasting social development, protecting ecosystems and alleviating poverty.



2012 INTERNATIONAL YEAR OF
SUSTAINABLE ENERGY
FOR ALL



Get 10, 13 or 17 August 2012
into your school calendar
for this year's Physics is Fun
in National Science Week

Fun Park Excursions to Luna Park Sydney

THE CHEAPEST SCHOOL PRICES
are through Physics is Fun!

★ ◆ ★ ◆ ★

Come for just a fun day
or an educational day!

Don't pay more ... save \$\$\$

ANY FACULTY CAN COME

Worksheets (if needed) are available

★ ◆ ★ ◆ ★

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★ OUT NOW: 2012 editions Past HSC Questions & Worked Solutions ... see p7 ★

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★★ ATTENTION ★★

After you have read this, please write/
tick your name below and pass it on.

- 1.
- 2.
- 3.
- 4.
- 5.

Please return to file or noticeboard.

PRIZES TO WIN!

See pages 1, 11 & 12
Send in your entries now
(ALL IN THE ONE ENVELOPE if you prefer!)

Past issues of SciTalk are available at
www.odlumgarner.com

Book Giveaway

WIN this set of books ...

PEARSON Skills: Science and Inquiry
Books 1: Yr 7-8 & Book 2: Yr 9-10
by Greg Laidler et al



ISBN: Bk 1-9781442527867, Bk 2-9781442529465
RRP \$24.95 ea

Science and Inquiry 1 and 2 are both ideal for students and teachers who need quick, simple additional support for learning/teaching essential Science and inquiry skills. A comprehensive content enables students to model and master the basic Science skills to a level not available in any other book on the market, and without requiring extra resources and support. This essential handbook for students addresses all the requirements of the Australian Curriculum.

TO WIN: Send your name, school & school address (& subject) on an envelope by 5 April 2012 to: Book Giveaway, PO Box 442, Freshwater 2096

★ ★ ★

Winners for SciTalk 4/11

Kaylene Jones, Ambarvale HS & Damian Byrne, Forbes HS respectively won Earth & Environmental Science & Senior Science 2009-2010 Past HSC Papers with Worked Solutions (rrp \$18 ea) published by Odum & Garner.

Diary Dates



2012 – International Year of Sustainable Energy for All

For: Shell Questacon Science Circus 2012 program:

www.questacon.edu.au/html/on_the_road.html

tba: Astronomy Open Nights & Lectures: Macquarie Uni,

www.physics.mq.edu.au/astronomy

MARCH 2012

- 4–10 SeaweeK2012: www.mesa.edu.au & www.ausmepa.org.au Theme: 'Marinedebris–Cleanup!'
- 2 Schools' Clean Up Australia Day. Ph: 1800 282 329. www.cleanupaustrialiaday.org.au
- 19, 23, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 20 Autumn Equinox (4.14 pm AEDT)

APRIL 2012

- 2 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 22 International Earth Day. www.earthday.net/ & www.earthsite.org/ [Note: 20 March is the original day to celebrate the equinoctial Earth Day, but it is now celebrated on 22 April in many places.]

MAY 2012

- 2–4 Science at the Shine Dome teachers' program, Australian Academy of Science: Theme: 'Antarctic Science: from Mawson's expedition to today'. Details: www.science.org.au/events/
- 4, 25 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 23 Rio Tinto Big Science Competition: www.asi.edu.au/bigscience/ Closing date: 18/4/12

JUNE 2012

- 1, 4, 8 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 5 World Environment Day
- tba Closing date Crystal Growing Comp. www.chem.unsw.edu.au/RACI/ Ph: (02) 9663 4960
- 15, 16 (metro) NSW Schools Titration Competition. www.nswtitration.com/ (see website for regional dates)
- 15, 16 (metro) NSW Schools Titration Competition. www.nswtitration.com/ (see website for regional dates) ... National Competition: 15 September at UNSW (tbc)
- 21 Winter Solstice (9:09 am EST)

JULY 2012

- 8–11 CONASTA 61 in Canberra. Theme: 'Science is critical'. Details: www.conasta.edu.au/
- 21–28 National Chemistry Week. www.raci.org.au/national/events/chemistryweek.html
- 26 National Chemistry Quiz. www.raci.org.au/ in "Events". Details: ph (02) 6331 5125

AUGUST 2012

- 3 Jeans for Genes Day. www.jeansforgenes.org.au/
- 8 Chemistry Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 6/7/12. Ph: 6201 2552
- 10, 13, 17 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
– come on one of these dates to celebrate National Science Week
- 11–19 National Science Week. School theme: 'Energy Evolution'
- 13 Biology Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 6/7/12. Ph: 6201 2552
- 15 Physics Olympiad Exam. www.asi.edu.au/olympiads/ Close date: 6/7/12. Ph: 6201 2552

SEPTEMBER 2012

- 14, 17 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 23 Spring Equinox (12:49 am EST)

OCTOBER 2012

- 14–20 EarthScienceWeek. [www.earthsciweek.org&www.ga.gov.au/education/events,ph\(02\)6249911](http://www.earthsciweek.org&www.ga.gov.au/education/events,ph(02)6249911)
- 15, 19, 22, 26, 29 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

NOVEMBER 2012

- 2, 12, 16 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 19, 23, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105

DECEMBER 2012

- 3–19 Physics is Fun at Luna Park Sydney. Enquiries: ph (02) 9939 6107, fax (02) 9939 6105
- 21 Summer Solstice (10.11 pm AEDT)

JANUARY 2013 National Youth Science Forum. Forms to local Rotary club by 29/5/12, interviews from July. Only for Yr 11 in 2012. Enquiries: 6125 2777, email: nsss@anu.au, www.nysf.edu.au/

While all dates have been checked to ensure that information in DIARY DATES is correct, no responsibility will be accepted by the publisher or Editor for any omissions or inaccuracies in it.

Do not go where the path may lead,
go instead where there is no path and leave a trail.

... Ralph Waldo Emerson

Update on BOS matters

Regularly check the BOS website to ensure you have the latest data – for syllabuses, past exam papers, news, Official Notices, Board Bulletins, statistics archive & more.

Curriculum Requirements for NSW Schools in 2012 (BOS 37/11)

Schools should continue to use the existing NSW K–12 syllabuses for 2012.

Draft Syllabus for K–10 Science

Revision following the first round of consultation on the Draft Syllabus for K–10 Science are underway and a second round of consultation should be held in Term 1, 2012.

HSC-University Pathways for talented HSC students 2012

Talented students who have accelerated in at least one HSC course and achieved high-level results can apply to begin their university studies and fast-track their first university degrees. Programs are being provided by The University of New England, the University of NSW and Macquarie University. More details are on the BOS website.

BOS enquiries

Ph: (02) 9367 8111, fax: (02) 9367 8484

Website: www.boardofstudies.nsw.edu.au/
BOS contacts for Science:

- Inspector Science, K–12 & Senior
- Assessment Officer – Science

NOTE: Your purchase of the Odium & Garner Past HSC Biology, Chemistry and Physics books helps to support the production of their Past HSC books for Earth & Environmental Science and Senior Science. Thank you to all the teachers who support these projects.

Promoting sustainability in the Year of Sustainable Energy for All

This year is a great time to make sure that we are teaching our Science students about energy efficiency, sustainable energy sources and use, sustainable development and the protection of global climate. Schools should also be looking at how they can employ sustainable management of resources and facilities in their everyday operations.

As mentioned in the last issue of *SciTalk*, the Australian government has established a Sustainable Schools Initiative to support schools and communities in becoming sustainable (www.environment.gov.au/education/aussi/index.html).

Australian Museum School Programs 2012

Involve your students in exciting exhibitions and stimulating curriculum-linked programs exploring nature and cultures

New Temporary Exhibition:

Deep Oceans

16 June – 14 October, 2012

Oceans cover over 70% of our planet, yet despite being the largest habitat for life on Earth, less than a tenth of the deep ocean realm has been explored! What's down there?

Featuring an innovative combination of interactive exhibits, fascinating objects, incredible specimens and some remarkable stories, the Deep Oceans exhibition takes you on a journey to the most inaccessible ecosystems on Earth, home to some of the strangest creatures, living under some of the most inhospitable conditions on the planet. Don't miss this exciting exhibition jointly developed by the Australian Museum and Questacon.

For visiting school group bookings and further information:

Ph (02) 9320 6163 Fax (02) 9320 6072 www.australianmuseum.net.au/education-services

Permanent exhibitions to explore:

- Dinosaurs
- Surviving Australia
- Birds and Insects
- Skeletons
- Planet of Minerals
- Albert Chapman Mineral Collection
- Search and Discover
- Indigenous Australians



FOR SECONDARY SCHOOLS

Hands-on sessions with a Museum educator are included with:

- Evolution of Australia Biota (Yr 11–12)
- Human Story (Yr 11–12)
- Fossils (Yr 7–12)
- Earth and Environmental Science Sessions (Yr 11–12)
- Evolution Trail Combo (Yr 9–10)

K–12 self-guided activities are also available from website.

AUSTRALIAN MUSEUM

6 College Street, Sydney
(opp. Hyde Park)
open daily 9.30 am – 5 pm

www.australianmuseum.net.au



2012 Chemical Safety Mandatory Training



- Run by members of the Royal Australian Chemical Institute (RACI), NSW Chemical Education Group, Chemical Safety Mandatory Training can be organised at your school.
- Two trainers come to the school. One trainer takes the technical staff (Science, TAS, VA), while the other takes the non-technical staff.
- Participants' notes, a training record and certificates of completion valid for 5 years are provided.
- Up-to-date with the latest legislation.
- The training is registered with the NSW Institute of Teachers as an accredited in-service for 2½ hours. Training takes 2½ hours for the non-technical staff and 3 hours for the technical staff (tea-break included in both).
- Phone course convenor Margaret Lindsay, secretary of the Chemical Education Group, on 0403 079 788 or email margaret.lindsay@nowt.com.au for prices and availability.

RACI NSW SCHOOLS TITRATION COMPETITION 2012

The NSW Schools Titration Competition is on again in 2012 (usually around June). This competition is a great way for Year 11/12 chemistry students to test their quantitative analytical skills.



It is organised by the NSW Chemical Education Group of the Royal Australian Chemical Institute (RACI). Students have 90 minutes to complete a set of acid-base titrations to determine the unknown concentration of a weak acid. Entry is \$36/team of 3 students – with a maximum of 8 teams/school.

A team's score depends on the accuracy of each member. At each venue, each member of the winning team wins a trophy. Winning teams may then be invited to the 2012 National Competition (usually around September). All students receive a Certificate of Excellence or Merit or Participation. The **de Miklouho-Maclay Prize** (certificate & \$100) is awarded to the NSW student with the best overall results.

Competition entry can be used to satisfy 1.5 hours of practical experience and contribute to the Chemistry Syllabus outcomes: P2, P10, P12 & H12 [12.2(a), 12.2(b), 12.4(b)].

★ **2011 NSW Schools Titration Competition:** The standard of the teams in 2011 was excellent. Congratulations especially goes to: *1st:* Strathfield Girls High, *2nd:* St Mary's Cathedral College, *3rd:* Smiths Hill High.

★ **2011 National Competition:** In the top 27 scores out of 128 teams, seven were achieved by NSW teams. Our strongest results were: Shore School in equal 4th place, plus 6th and 8th place. Other strong results were: James Ruse Ag HS in 20th place & Newcastle Grammar in 21st place.

★ **2011 de Miklouho-Maclay Prize** for excellence in Chemistry with the best overall result in the National Titration Competition went to Michael Jamieson of Shore.

★ Congratulations to all these competitors!

★ **For details, entry forms, hints & tips:**

• www.nswtitration.com

• Email: ajhey@nswtitration.com • Ph: 4655 2961

• Post: PO Box 306 Camden 275 • Closing date: 4 May 2012

HSC statistics: Science entries in the 2011 HSC

The total number of entries for HSC Science courses* in 2011 was 44,371 and the total number of HSC entries for the 2011 HSC was 71,415. So Science entries were 62.1% of the total entries.

The number of HSC Science entries as a % of the total HSC entries from 1992–2011 is given in the bottom table below. This % has decreased significantly from a peak of 90.8% of the total candidature in 1992[#] with 54,414 students doing a Science course

Biology	
Total 2011 candidature	16,704 (♂ 6466 ♀ 10,238)
Q28. Communication	65.9%
Q29. Biotechnology	6.3%
Q30. Genetics: The Code Broken?	19.5%
Q31. The Human Story	7.7%
Q32. Biochemistry	0.2%
	99.6% §

Chemistry	
Total 2011 candidature	10,965 (♂ 6050 ♀ 4915)
Q28. Industrial Chemistry	49.3%
Q29. Shipwrecks, Corrosion and Conservation	33.9%
Q30. The Biochemistry of Movement	1.3%
Q31. The Chemistry of Art	3.1%
Q32. Forensic Chemistry	12.2%
	99.8% §

Physics	
Total 2010 candidature	9382 (♂ 7247 ♀ 2135)
Q28. Geophysics	1.2%
Q29. Medical Physics	28.7%
Q30. Astrophysics	21.9%
Q31. From Quanta to Quarks	47.1%
Q32. The Age of Silicon	0.9%
	99.8% §

Entries for HSC Science courses 1992–2011 as a percentage of the total number of HSC entries[#]

YR	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11
%	90.8	87.7	80.1	72.0	73.8	72.3	70.2	69.9	64.1	58.0	55.8	56.5	58.3	58.4	59.4	57.9	60.5	59.8	59.9	62.1

Science on the web

• Nuclear power source for Mars Curiosity rover

NASA's Curiosity rover is the biggest, most sophisticated robotic explorer every built. You can go on a video tour of the Idaho National Laboratory that recently assembled and tested the radioisotope power source for use in the Curiosity. This explains how the nuclear battery was built, beginning with the plutonium-filled iridium capsules. It shows how the engineers go about handling the radioactive material.

www.planetary.org/blog/article/00003276/ (last accessed 30-1-12)

• Mars500 isolation experiment a success

The Mars500 crew of six 'landed' back on Earth in November 2011 after living like astronauts for 17 months in a specially designed facility in Russia that simulated the phases of a trip to Mars: a long flight to the red planet, entering into orbit, landing on the surface, exploration, then returning to Earth. This project was designed to see if humans could cope psychologically with the demands of such a trip.

www.bbc.co.uk/news/science-environment-15574646
www.esa.int/SPECIALS/Mars500/ (last accessed 30-1-12)

• World's lightest material

Researchers at HRL Laboratories, in the US, have developed the world's lightest solid material with a density of 0.9 mg/cc, approximately one hundred times lighter than Styrofoam. It has a unique 'micro-lattice' structure of interconnected hollow tubes with a wall thickness of 100 nanometers, 1000 times thinner than a human hair.

hrl.com/hrlDocs/pressreleases/2011/prsRls_111117.html (last accessed 9-1-12)

to only 55.8% in 2002. Since 2004, it has hovered around 58–60%, which is still much lower than in past years.

The pattern of options in the various Science courses for the 2011 HSC has not varied greatly. The pattern of options presented at the 2011 HSC for each Science course is given as a percentage in the following tables.

Earth & Environmental Science	
Total 2011 candidature	1473 (♂ 774 ♀ 699)
Q28. Introduced Species & the Australian Environment	84.7%
Q29. Organic Geology – A Non-renewable Resource	3.3%
Q30. Mining and the Australian Environment	0.5%
Q31. Oceanography	11.3%
	99.8% §

Senior Science	
Total 2011 candidature	5377 (♂ 2831 ♀ 2546)
Q28. Polymers	4.0%
Q29. Preservatives and Additives	4.7%
Q30. Pharmaceuticals	19.9%
Q31. Disasters	63.4%
Q32. Space Science	7.7%
	99.7% §

* These are the total number of entries in Science courses, and not the actual number of students who study a Science course, since a fair percentage actually study 2 courses in the same year, and some students since Pathways do 3 science courses.

The total number of entries prior to 1996 was based on the total English candidature. Since then, due to Pathways, the total figure each year is still based on English entries, but is slightly affected by acceleration students, Pathways students, etc.

§ The total number of students below reflects the actual number of students who received a result for each subject. It differs from the figures given in the media as their figures were the number of HSC entries for each subject as of October 2011. There is usually a difference between these two sets of figures because some students have illness/misadventure and so do not sit for the examination.

[Note: Individual option percentages are rounded to the nearest 0.1%, thus totals are not exactly 100.0% for some courses.]

Science Life Skills: Total 2011 Candidature was 470 (308 males, 162 females).
(This course is part of the total science entries.)

These tables were prepared by Robert Garner using data provided by the NSW Board of Studies, Dec 2011.

Senior Science Fun Park Excursion to Luna Park Sydney

Many first-hand experiences in the Senior Science syllabus are covered by doing a *Senior Science Excursion* to Luna Park Sydney through *Physics is Fun*. Worksheets are provided for:

- ★ **Preliminary Topic 8.4 Humans at Work** – students assess the impact of science in the design/construction of safe rides; identify & assess potential hazards/factors that increase risk of injury; perform an occupational health & safety style audit; determine what safety measures will protect the human body from injury.
- ★ **HSC Option 9.8 Disasters** – students explore the possible consequences of a disaster such as the collapse of a ride at Luna Park Sydney, and how emergency services would assist in the minimisation of the effects of such a disaster.
- ★ **HSC Topic 9.4 Information Systems** – students investigate the need/use of these.
- ★ **HSC Option 9.5 Polymers** – students investigate the types used & their impact.

Interactive learning is a great way for students to learn and have fantastic fun at the same time. So come to a *Senior Science excursion* at Luna Park Sydney through *Physics is Fun*!

Details are on page 6 of this *SciTalk*. Bookings/enquiries: ph 99396107, fax 9939 6105, www.odlumarner.com

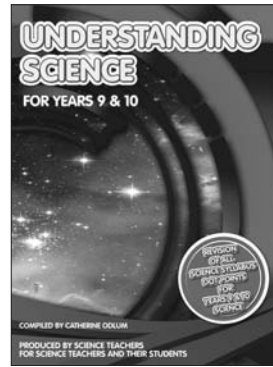
★ Ideal revision guides, or for homework or assignments ... for success in Science 7–10 ★



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[Note: Luna Park is open every day in December]

TIME Rides start at 11 am

COST Only \$24.50*/student plus \$20* booking fee/school [Non-scheduled days: from \$25.50*/student]

Teachers **FREE:** 1/8 primary or 1/15 secondary students.

Entry to Luna Park is FREE.

Extra teacher ride tickets are \$25.50*

* plus 10% GST (schools can claim this back, only if doing a curriculum-specific excursion).

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Interactive learning is a great way for students to discover that learning is not so dull after all! These excursions are presented by experienced teachers.

WORKSHEETS AVAILABLE

Secondary: Mathematics, Science 7–10, Physics, Biology, Senior Science; Technology; Peer Support; Commerce; Business Studies, Tourism; Photography, Visual Arts.

Primary: Science & Technology, English, & Mathematics; Visual Arts; Peer Support.

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ENQUIRIES/BOOKINGS

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Ph (02) 9939 6107 Fax (02) 9939 6105
Email: robertgarner@mac.com
- Send a deposit of \$100 (+ GST) to confirm your booking.
- Worksheets (if requested) are sent after your deposit is received.

Come for
a great fun day!

**Physics is Fun
Fun Park Excursions**
The original and best

Physics is Fun was co-authored in 1983 by Robert Garner and Sylvia Jennings and was based on their earlier excursions at Luna Park in the 1970s. Robert has conducted these fun park excursions since their inception ... both at **Luna Park** (1983-1987, 1995, 2004-2011) and **Wonderland Sydney** (1990-2004) – covering many different subject areas. With the closure of Wonderland Sydney in early 2004, these Fun Park Excursions have been at **Luna Park Sydney** since its re-opening in April 2004.

Please note: Our excursion notes are only for use when on an excursion day booked through Physics is Fun. It is an offence under Copyright Laws to use them on any other occasion without written permission from Physics is Fun.

A RISK ASSESSMENT, TAX INVOICE and BOOKING FORM
are available on our website at: www.odlumgarner.com

2012 editions: Past HSC Papers with Worked Solutions

All books include: PAST HSC QUESTIONS BY TOPIC GUIDE

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- **WORKED ANSWERS** to **all** the Core and **all options** that would score full marks **AND** are an **appropriate length**, with full **EXPLANATIONS** for all multiple choice questions
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- **GUIDE ON HOW TO ACHIEVE SUCCESS IN THE HSC** ... with essential exam techniques and how to study effectively to maximise marks in the HSC
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20% discount for bulk orders*

Odlum & Garner	Title	ISBN	RRP	ORDER
2001–2011 books:	2001–2011 Biology Past HSC Papers with Worked Solutions	978 1 921741 03 6	\$36	
	2001–2011 Chemistry Past HSC Papers with Worked Solutions	978 1 921741 04 3	\$36	
	2001–2011 Physics Past HSC Papers with Worked Solutions	978 1 921741 05 0	\$36	
2006–2011 books:	2006–2011 Biology Past HSC Papers with Worked Solutions	978 1 921741 06 7	\$27	
	2006–2011 Chemistry Past HSC Papers with Worked Solutions	978 1 921741 07 4	\$27	
	2006–2011 Physics Past HSC Papers with Worked Solutions	978 1 921741 08 1	\$27	
Earth Science:	2001–2008 Earth & Environmental Science Past HSC Papers with Worked Solutions	978 1 875918 70 6	\$33	
	2009–2010 Earth & Environmental Science Past HSC Papers with Worked Solutions	978 1 875918 97 3	\$18	
Senior Science:	2001–2008 Senior Science Past HSC Papers with Worked Solutions	978 1 875918 71 3	\$33	
	2009–2010 Senior Science Past HSC Papers with Worked Solutions	978 1 875918 98 0	\$18	

Name:
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PhoTo Spot 'Rutile furball' ... a grain of titanium oxide

Rutile is a mineral composed mainly of titanium oxide, TiO_2 . It is a common accessory mineral in high-temperature and high-pressure metamorphic rocks and in igneous rocks. It is one of the five forms of titanium dioxide found in nature.

Rutile often forms an important constituent of heavy mineral sands. These ore deposits are found in beach sands from which miners also extract and separate zircon and ilmenite.

Titanium dioxide is a very white, opaque substance. Because of its opaque and reflective properties, it is used as a pigment in paints, plastics, paper, foods, and other applications that call for a bright white colour. Titanium dioxide pigment is the single greatest use of titanium worldwide. Nanoscale particles of rutile are transparent to visible light, but are highly effective in the absorption of ultraviolet (UV) radiation. Hence titanium dioxide is used in sunscreens to protect against UV induced skin damage.

Small rutile needles present in gems are responsible for an optical phenomenon known as asterism. Astered gems are known as 'star' gems. Star sapphires, star rubies, and other 'star' gems are highly sought after and often more valuable than their normal equivalents. Rutile is also widely used as a welding electrode covering and in the production of titanium metal.

The name 'rutile' is derived from the Latin *rutilus* (red) in reference to the deep red colour seen in some specimens when viewed by transmitted light. Rutile crystals can also be a reddish brown, red, pale yellow, pale blue or violet colour. It is sometime black if high in the elements niobium and tantalum. The crystals of rutile are usually tetragonal.

Rutile is naturally occurring in Australia, USA, India and South Africa. Synthetic rutile can be produced from naturally occurring ilmenite, which is a complex oxide with iron. In Australia, most rutile is produced from ilmenite as it naturally occurs in accessible high concentrations and in a form that allows the ready extraction of rutile. These favourable factors have made ilmenite a competitive raw material for Australian producers reflected in high export activity. Australia supplies about 40% of the world's ilmenite and about 25% of its rutile.

Synthetic rutile was first produced in 1948 and is sold under a variety of names. Very pure synthetic rutile is transparent and almost colourless (slightly yellow) in large pieces. Synthetic rutile can be

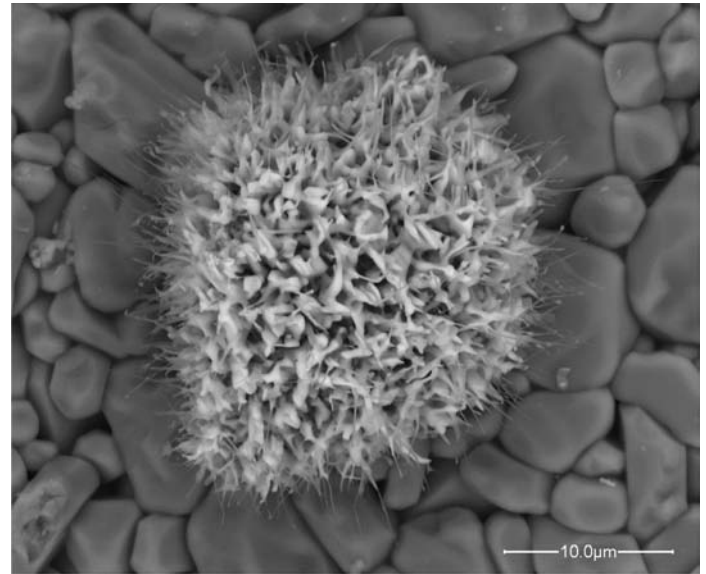


FIGURE 1: 'Rutile furball' ... this porous, needle-covered grain of titanium oxide was taken using a scanning electron microscope by Aaron Torpy, at the CSIRO Division of Minerals.

made in a variety of colours by doping, although the purest material is almost colourless. Its high refractive index gives it a good lustre and strong refraction that leads to a diamond-like appearance. The near-colourless diamond substitute is sold under the name 'Titania', which is the old-fashioned chemical name for this oxide. However, rutile is seldom used in jewellery because it is not very hard, measuring only about 6 on Moh's scale of hardness. Titania should not be confused with cubic zirconia, which is synthesised as a diamond substitute. Cubic zirconia is the cubic crystalline form of zirconium dioxide (ZrO_2) and has a hardness of around 8.3, which is much closer to diamond's hardness of 10 than titania.

References:

• www.chemlink.com.au • www.australianminesatlas.gov.au • www.mindat.org

Sawfish – a sight to behold for 'saw' eyes

Sawfish (or 'Carpenter Sharks') belong to a family of tropical rays that have a long, flat saw-like rostrum (nose/snout) and a flattened body. All species of sawfish are considered 'critically endangered' as their numbers have decreased or will decrease by 80% within three generations. There are eight species of sawfish worldwide, of which five can be found in Australian waters. Sydney Aquarium hopes to raise awareness about the need to conserve unique marine life, such as sawfish and have had four Smalltooth Sawfish arrive there recently.



FIGURE 1: A sawfish swimming around at Sydney Aquarium
[photo supplied by Sydney Aquarium]

Sawfish are adapted to living in both freshwater and saltwater. Related to sharks and stingrays, they can grow up to 7.6 metres long. They inhabit many rivers, creeks and bays in QLD, NT and WA and are common on mudflats in the Gulf of Carpentaria and Arnhem Bay.

The colour of sawfish makes them well adapted to their environment. Their upper surface is dark to blend in with the muddy seafloor, while the underside is white, to blend in with the water surface when seen from below. Their diet includes bottom-dwelling invertebrates, such as crabs and shrimps, and small fish. The 'teeth' on the sawfish's snout are actually modified scales. A sawfish's real teeth are inside its mouth on its underside. A shark-like tail propels the sawfish through the water and its flattened body and head indicates it is a bottom-dwelling organism.

The water they live in is shallow and very muddy, so Sawfish cannot see well and rely on their sensitive snouts for information about their surroundings. Their snout has a number of adaptations for getting food. Electro-receptors can sense the heartbeats of buried prey and it is motion sensitive and so can track swimming fish. The snout is able to be used like a rake to unearth the buried prey and like a slashing saw tool to stun or kill fish or to defend themselves against predators, such as sharks and intruding divers.

Sawfish are nocturnal and do not attack people unless provoked or surprised. Reproduction occurs through internal fertilisation. Their eggs develop inside the mother's body and females give birth to live young with a semi-hardened rostrum, covered with a temporary membrane to prevent injury to its mother during birth.

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All papers will be delivered in **Week 1 of Term 3**. Invoices will be sent with the papers. Papers can be used as exams at any time after delivery, but are not to be released to students before 13 August (Trial), 17 September (Preliminary) or 29 October (Year 10 Exam).



As Summer heads into Autumn

... Robert Garner

The warm nights going from Summer into Autumn are a great time for getting your students enthusiastic about looking at the night skies and 2012 is a great year for Astronomy in Australia with two big events visible in Australian skies this year.

Remember, viewing the night skies is much simpler if you have a Sky Chart / Planisphere to view the skies. See Box 1 for details on how to easily obtain one of these.

The Planets

Mercury, Venus, Mars, Jupiter and Saturn can all be seen with the naked eye. *Venus* will be bright in the western evening sky from February to April. *Mars* will appear in the late evening NE sky with its distinctive orange-red colour in February. It fades noticeably during April. *Jupiter* will be bright, low in the western sky – but by April will disappear into the twilight. *Saturn* will be rising in the early evening eastern sky. By mid-April, it will be at opposition when it is 180° from the Sun, so it is rising as the Sun sets. However, *Mercury* will difficult to see until it becomes a morning object in the eastern pre-dawn sky in mid-April.

Constellations

Orion will be high in the north to north-west evening sky, with the *Taurus* constellation closer to the horizon and slightly to the west. In *Taurus*, you will be able to find *The Pleiades* or Seven Sisters (or Subaru to the Japanese), a small cluster with many young blue giant stars. This cluster lies below the orange-red star *Aldebaran*, the brightest star in *Taurus*, and to the right of the planet *Venus*. The brightest stars of *The Pleiades* can be seen with the naked eye, but with binoculars many more become visible.

Sirius is the brightest star that you will see in the sky and is close to overhead at sunset. It is in the constellation *Canis Major*.

Crux, the Southern Cross, will be in the southern sky in its autumn orientation on its side with the pointers below it. Remember you can see *The Jewel Box* between the two brightest stars of *Crux*. This open cluster can be seen with either binoculars or a telescope.

Meteor showers

The alpha Centaurid meteor showers that occur at this time will not be easily seen because their peak coincides with a Full Moon on 8 February 2012. So you are advised to look at the Moon instead!

Equinox

The autumn equinox for the Southern Hemisphere occurs at 4.14 pm on 20 March 2012.

Aboriginal perspectives on astronomy series

Past articles from the 'Aboriginal perspectives on astronomy' series that appeared in *SciTalk* are at www.odlumgarner.com –

- The Emu ... *SciTalk* No. 1-2004
- The Southern Cross ... *SciTalk* No. 3-2008
- The Moon ... *SciTalk* No. 1-2009
- Pleiades ... *SciTalk* No. 2-2009
- The Milky Way ... *SciTalk* No. 3-2009
- Magellanic Clouds ... *SciTalk* No. 4-2009
- The Beehive Cluster ... *SciTalk* No. 1-2010
- Venus ... *SciTalk* No. 2-2010
- The Sun and Moon ... *SciTalk* No. 3-2010
- Colour of stars in Hyades ... *SciTalk* No. 4-2010

Remember – dreaming stories and characters vary among Aboriginal groups. Although they may share many of the same beliefs, the messages and the characters in their stories are different. The various Aboriginal groups divided the night sky into about 40 different constellations, which they named them after different native birds and animals.

Transit of Venus – 6 June 2012

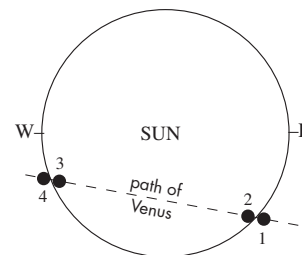
A transit of a planet occurs when the planet passes directly between the Earth and the Sun, so only Venus and Mercury can transit across the face of the Sun. Venus will be doing a transit on 6 June 2012.

Transits of Mercury occur 13 or 14 times per century, but transits of Venus are quite rare events and occur in a repeating cycle separated by 8, 122, 8 and 105 years in turn. So get this event into your calendar now – as it will not occur again in your lifetime!!

The first transit of Venus since 1882 occurred on 8 June 2004. The next transit will occur on 6 June 2012, and be visible in Sydney from beginning to end, starting at 8.16 am (1st contact) and ending at 2.44 pm (last contact). However, the following transit of Venus will not occur until 2117.

Transits of Venus have particular significance for Australians as it was the transit of Venus in 1769 that led to Captain James Cook's discovering Australia. Cook, along with astronomer Charles Green, was sent out in the HM Bark Endeavour to observe the transit in Tahiti and to search for the southern continent. From Tahiti, Cook sailed to the east coast of Australia which he called New South Wales and claimed for the British Crown in 1770.

The transit of Venus is important scientifically because it enabled the measurement of the distance from Earth to the Sun – and so to determine the scale of the solar system. This is now done more accurately using radar.



Path and contacts for Venus' transit across the Sun (as seen from Sydney)

1st to 4th contact times will be:

1 at 8:16, 2 at 8:34, 3 at 14:26, 4 at 14:44.

WARNING: It is dangerous to look directly at the Sun, especially through binoculars or telescopes. SERIOUS EYE DAMAGE MAY RESULT. You should view the Transit safely at an observatory using the correct type of solar filter to ensure safe viewing of this spectacular event.

ADVANCE NOTICE

Total eclipse of the Sun: 14 November 2012

Box 1: Sky Charts & Planispheres

- You can download free sky charts each month to explore the night sky (planets, stars & constellations) from: <http://skymaps.com/downloads.html> Make sure you scroll down to the 'Southern Hemisphere Edition'.
- A planisphere (star wheel) is a great aid for exploring the *stars* and locating *constellations*. These are inexpensive and available from astronomy shops, or you can download one from the internet – make sure it is for the Southern Hemisphere. There is a planisphere (star wheel) to print and use at: <http://members.ozemail.com.au/~starrylady/Planis1.htm>

CONGRATULATIONS

SciTalk No. 4–2011 'Astronomy Giveaway' winners, Robert Crosdale, Lake Munmorah High and Claudia Gee, Ambarvale High each won a copy of:

**ASTRONOMY 2012
A PRACTICAL GUIDE TO THE NIGHT SKY**

by Glenn Dawes, Peter Northfield, Ken Wallace

Available from Quasar Publishing: <http://www.quasarastronomy.com.au/>

OR The Binocular & Telescope Shop, 84 Wentworth Pk Rd, Glebe 2037
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On clear nights, our 'starfinder' (planisphere) sessions demonstrate how to identify bright stars, constellations and planets. This is followed by observing with the telescopes. Even with the light pollution of the city, we can easily see double and multiple stars, open and globular star clusters, and the brighter nebulae. The Moon and planets, when in suitable positions, are easily viewed with any of our instruments. On dark, moonless nights with good seeing, we may also observe the brightest galaxies.

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... Zig Ziglar

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To find out more about shows/concerts in Luna Park Sydney's Big Top, or their function venues or The Deck restaurant with their spectacular harbour views, go to: www.lunaparksydney.com

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(unlimited ride passes for 2 adults & 2 children worth \$180) ... send in your name, school, & school address on an envelope **by 5 April 2012** to:

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WINNER: Yvonne Clark, Mamre Anglican School, won a Luna Park Sydney family pass for SciTalk No. 4–2011.

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HOW TO ENTER: Send an answer to the Quiz Question, your name, school & school address on an envelope to: Competition Corner, PO Box 442 Freshwater 2096 – by 5 April 2012.

SciTalk 4/11 answer: mercury & bromine

QUIZ QUESTION: What is the chemical equation for the combustion of hydrogen?

Winner for SciTalk 4/11: General Science (7A), Biology (7B), Earth & Space (7C) for Secondary Science published & donated by Five Senses Education was won by Katrina Piper, St Mary's High, Gateshead.

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SciTalk is a newsletter for secondary Science educators. Now in its 16th year, it has been produced quarterly by Odium & Garner as a service to Science teachers since 1995. It is sent FREE-of-charge to all secondary Science faculties in schools and TAFEs throughout NSW and the ACT.

SciTalk aims to provide science teachers with up-to-date information, important dates, the latest products available, plus 'what's on' in various excursion venues, and more.

Please pass *SciTalk* on to all Science teachers at your school so they can benefit from it – or put it up on your notice board for reference.

Contributions, advertising and inserts are welcome. Copies of *SciTalk* are also available at:

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CONTRIBUTIONS

SciTalk is due into schools mid-term. All contributions for *SciTalk* should be directed to the Editor (see below).

- CLOSING DATES**
- *SciTalk* No. 1–January 2012 ... Dec 16
 - *SciTalk* No. 2–May 2012 ... April 5
 - *SciTalk* No. 3–August 2012 ... June 8
 - *SciTalk* No. 4–October 2012 ... Sept 21

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