

SciTalk

ISSN 1323-7667

Number 1 – February 2004

PRIZES TO WIN!

See pages 1, 3, & 12
Send in your entries now!

★★ ATTENTION ★★

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

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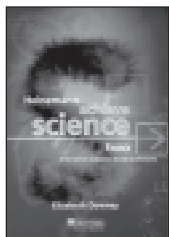
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Book Giveaway

You could WIN ...

Heinemann Achieve Science series

Elizabeth Downey



Book 1: \$99.00, Book 2: \$99.00
(Value Pack Books 1 & 2: \$165.00)

Heinemann Achieve Science 1 and 2 series is a totally new approach to the traditional area of photocopiable blackline masters.

The self-contained outcomes-based worksheets are aimed at students who find the content of traditional science textbooks difficult. They cater for a range of different learning styles and present innovative and stimulating activities as alternatives to the explanations in texts. The worksheets can be integrated into any teaching program and will allow students to work effectively towards achieving the desired outcomes.

TOWIN: Send in your name, address, ph. no. & school, & book you want to win, on the back of an envelope ... by 2 April 2004 to:

Book Giveaway, PO Box 442, Harbord 2096

Winner for SciTalk 4/03

Congratulations to Maree Harries, Hay War Memorial HS, who won *Physics 1* and *Physics 2* by Michael Andriessen et al, donated by Jacaranda (rtp Bk1: \$52.95, Bk 2: \$54.95).

Hands-on science is fantastic fun

Be part of the fun as Luna Park Sydney is coming back this April and take your students there for an exciting day of interactive learning.



Our popular excursions provide students with hands-on activities, and cover concepts in the current Science syllabuses for Years 7–12.

If you have ever been on a Physics is Fun excursion you will know how practical and beneficial the day is, and if you haven't been, the opening of Luna Park Sydney is a great excuse to bring your students for an educational day where they will also enjoy the thrills and exhilaration of fun park rides.

Students whiz through the air, collide with each other, and shoot down slides all in the name of learning about forces, motion, energy, machines, and more.

Science 7–10 and Physics students will have a great time as they grapple first hand with concepts such as gravity, energy conversions, and friction. Extension work on circular motion will help students appreciate the application of physics to everyday situations. Those of you who remember when Luna Park was last open will no doubt recall with fondness the Dodgems and just how teenagers can extract collision and inertia concepts in a fun setting, whilst also seeing how they apply to real-life situations such as negotiating traffic on the roads in the family car.

Senior Science students will investigate the effects of rides on the human body, the design and construction of rides and potential hazards. They will conduct a safety audit and determine what safety measures are needed to protect the human body from injury in such an environment. They can also work out what

must be done if a disaster such as the collapse of a ride occurred.

Biology students will investigate the effects of gravity and inertia on living organisms, the role of sense organs when on a ride, the psychological and physiological aspects of stress,

and the environmental impacts of a fun park.

Fun park rides are a fantastic way to demonstrate physics principles and science and technology to your students in a relevant and interesting way – something they could never experience in the classroom.

Other school faculties can also bring their students to Luna Park and save money by booking their fun day through us. Many teachers use these days as picnic days or rewards at the end of a school term.

It has been eight years since teachers and their students have enjoyed these fun days in Coney Island, or experienced the 'roller-coaster' physics of the Wild Mouse. Very few, if any, of your students would ever have been to Luna Park and so they will approach this excursion with new eyes and enthusiasm.

Another reason we are now inviting you to Luna Park Sydney is that Wonderland Sydney recently announced it was closing in April and while it hopes to keep functioning until then, there is real concern that many of the rides may not be operating every day. We are therefore not offering any more excursions to Wonderland Sydney.

Bookings are now being taken for Terms Two, Three and Four for Luna Park Sydney. Come and be part of the fun at this harbourside venue, and let your students enjoy one of Sydney's icons. □

★ ◇ ★ ◇ ★

EDUCATIONAL WORKSHEETS & FUN DAYS are available for primary & secondary students

Secondary: Junior Science, Physics, Biology, Senior Science, Design & Technology
Primary: Science & Technology, English, Mathematics

Save \$\$\$... special DISCOUNT SCHOOL PRICES: see page 6

INSIDE SCITALK ▶▶▶▶▶

- FUN PARK EXCURSION at Luna Park 1, 6
- Diary Dates / BOS Update 2
- Out and About 3
- 2004 RACI Schools Titration Competition ... 4
- 2003 HSC Science Subject Statistics 5
- Science Teachers' Workshop: Uni of Syd ... 5
- Photospot: Data Tracks on a CD Surface 6

- Senior Science Luna Park Excursion 1, 6
- Science Tests for the School Certificate ... 7, 8
- PAST HSC Questions & Answers 7, 9
- Food Additives 8
- How to Achieve Success in the HSC 9
- Science Updates / Science on the Web 9
- Astronomy 10
- Competition Corner 12

Diary Dates 2004



Update on BOS matters

Implementation Support for 7–10 Syllabuses

You can discover when these meetings are on in each region at http://www.boardofstudies.nsw.edu.au/aa_main/syllabus_meetings.html. Bookings can be made online.

The meetings aim to assist teachers to identify key features of the new Years 7–10 syllabuses; make effective use of BOS support materials, including the Assessment for Learning in a Standards-Referenced Framework; Syllabus Support Materials CD-ROM; use Draft Descriptions of Levels of Achievement; integrate Information and Communication Technologies; understand Life Skills outcomes and content; and clarify School Certificate requirements.

Years 7–10 Science

The new amended 7–10 Science Syllabus, on the BOS website, is to be implemented with Years 7 & 9 in 2005, & Years 8 & 10 in 2006.

BOS website

Teachers and students should go to the BOS website for the latest information and syllabuses – www.boardofstudies.nsw.edu.au

BOS enquiries

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

Past HSC Examination Questions & Answers

by Odlum & Garner

Help your students do well in their HSC. The Past HSC books are available for Biology, Chemistry, Physics, Senior Science, and Earth & Environmental Science. They are the ONLY books with the actual exams. Make sure your students practise past HSC and check their answers. The Odlum & Garner books contain **CORRECT answers** (Band 6 level) for ALL questions, PLUS a complete set of **Blank Answer Booklets** and a guide on *How to Achieve Success in the HSC*.

Fun Park Excursions at



BOOK NOW for Terms 2, 3 & 4 as Luna Park Sydney opens APRIL

★ ◆ ★ ◆ ★

A great way to learn SCIENCE and have FUN at the same time (see page 6).

Worksheets are available for:

• Primary Science & Technology
• Junior Science 7–10 • Physics, Senior Science, Biology • Design & Technology

Book your date now by phone or fax on (02) 9939 6107 with Physics is Fun.

MARCH

- 7 Clean Up Australia Day. Ph: 1800 024 890. Details: www.cleanup.com.au
- 7–14 Seaweeek 2004. Theme: Discover me in the sea. Ideas/activities <http://www.mesa.edu.au/seaweeek>.
- 11 Mar–3 Apr Shell Questacon Science Circus Tour – Yass, Dubbo, Parkes, Orange, Mudgee, Scone, Bathurst, Lithgow, Katoomba. \$4/student (GST free). Details/bookings: www.questacon.edu.au
- 22 World Water Day. Theme: Water & Disasters. Details: www.worldwaterday.org/
- 27 Astronomy Open Night & Lecture ~20 telescopes operating, displays, sales. Macq Uni (E7B). 6–10 pm. No need to book. \$8 Ad \$4 Ch \$20 Fam. (02) 9850 7111. <http://www.physics.mq.edu.au/astronomy/cal.html>

APRIL

- 22 Earth Day. Enquiries and suggested activities: www.earthday.net/events/

MAY

- 4, 7 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 14 Closing date: Eureka Schools Prize (Lateral Thinking Competition). See page 4.
- 27 Australian Science Challenge. Cost: \$3.85 (incl GST) per student. For further details or an entry form: ph (02) 6125 9645, fax (02) 6125 9646, email: challenge@rtaso.org.au

JUNE

- 2, 4 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 5 World Environment Day. Details: www.unep.org/wed/
- 7–18 Science Teachers' Workshop on HSC Physics Syllabus: Syd Uni. Details on page 5.
- 18 / 19 Schools Titration Competition 2004. See page 4 of this SciTalk for details.

JULY

- 2 Closing date Eureka Prize School entries (for Earth, Environmental and Planetary Sciences, and for Biological Sciences). Enquiries: www.amonline.net.au/eureka
- 3 Closing date BHP Billiton Science Awards. See page 9 of this SciTalk for details.
- 3 HSC Biology Teachers Professional Development Program. See page 12 for details.
- 30 Closing date Olympiad National Qualifying Exams. Details: www.rtaso.org.au/

AUGUST

- 3–5 Science in the City – for secondary schools. Ph (02) 9320 6389, www.scienceinthecity.net
- 10–12 Science in the City – for primary schools. Ph (02) 9320 6389, www.scienceinthecity.net
- 14–22 National Science Week 2004. Enquiries: <http://scienceweek.info.au/>
- 16, 20 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 18, 19, 20 Australian Science Festival – school events. Canberra. Ph: (02) 6205 0588, www.asflimited.com.au
- 25 Physics Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645

SEPTEMBER

- 1 Biology Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645
- 14, 17, 20 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 26–30 CONASTA 53: ACT. Ph (02) 6281 6624, fax (02) 6285 1336, www.conlog.com.au/CONASTA53/

OCTOBER

- 18 Oct–13 Nov Shell Questacon Science Circus Tour – Hay, Deniliquin, Mildura, Wilcannia, Broken Hill, Swan Hill, Echuca/Moama. \$4/student (GST free). Details/bookings: www.questacon.edu.au
- 18 HSC examinations commence
- 20 Chemistry Olympiad National Qualifying Exam. Closing date: 30 July. (02) 6125 9645
- 22, 25, 26, 27 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 23 Astronomy Open Night & Lecture. (02) 9850 7111. <http://www.physics.mq.edu.au/astronomy/cal.html>

NOVEMBER

- 1, 2, 3, Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 8–9 School Certificate Tests. 8/11: English / Science. 9/11: Maths / AH,G,C&C
- 15, 16, 19, 23 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 24, 26, 30 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107

DECEMBER

- 1, 2, 3, 6, 7 Physics is Fun at Luna Park Sydney. Enquiries: ph/fax (02) 9939 6107
- 7 Ocean Care Day

JANUARY 2004 National Youth Science Forum. Forms to local Rotary club by 15/5/04, interviews in July. For Year 11 students in 2004 only. Enquiries: (02) 6125 2777, fax (02) 6125 8015, email: nssf@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.

★ The Ultimate Survival Kit for Year 10 ★

- *Success in School Certificate English* ... by B & S Pattinson (\$10.95)
- *New School Certificate Mathematics* (2nd ed) ... by Sami El Hosri (\$35.95)
- *Science Tests for the School Certificate* ... by Catherine Odlum et al (\$32.95)
- *Success in School Certificate Australian History, Geography, Civics & Citizenship* ... by B & S Pattinson (\$14.95)

SAVE \$\$\$ & make sure your Year 10 students do not miss out!

★ ◆ ★ ◆ ★

ENQUIRIES/ORDERS: ODLUM & GARNER

PH/FAX: (02) 9939 6107, PO BOX 442, HARBORD 2096. EMAIL: robertgarner@mac.co

RACI SCHOOLS TITRATION COMPETITION

State Competition – Metro Sydney: 18 or 19 June 2004, Regional venues: dates TBA

The Schools Titration Competition is a quantitative analytical competition open to NSW students in years 11 or 12. It operates at a number of venues, and is organised by the Chemical Education Group of the Royal Australian Chemical Institute (RACI).

Students compete in teams of three and, in 90 minutes, must complete a set of acid-base titrations to determine the unknown concentration of a weak acid.

The team's score will depend on the accuracy of the work of its members. The best score wins trophies for the team. They may then be invited to participate in the National Competition later in the year.

This competition is run throughout Sydney and at various NSW regional centres. Entry costs \$21/team (GST exempt).

Depending on their team's results, students may receive a Certificate of Excellence or Merit or Participation.

The **de Miklouho-Maclay Prize for Practical Chemistry** (a certificate

and cash prize) will be awarded to the student with the best overall results.

Go to www.nswtitration.com for more information/entry forms, or contact Alasdair Hey by email: ajhey@nswtitration.com, ph/fax (02) 9601 1021, or post: POB 282 Georges Hall 2198. The closing date is **30 April 2004**.



2003 Chemical Analysis Competition results:

In 2003 approx 950 students entered. Winning teams in the **NSW Schools Competition** were: Equal 1st–Girraween HS, Shore & Alstonville HS, 2nd–James Ruse, 3rd–St Leo's College.

2003 National Competition results: Of the top 25 scores, NSW achieved 13th place (Shore), 16th place (Barker), 22nd place (Willyama High) and 24th place (James Ruse Ag High).

The **de Miklouho-Maclay Prize** was awarded to William Wong, Fort St High.



Congratulations to these competitors!



ABC EDUCATION – SCHOOLS

GPO 9994, Sydney 2001
Ph: (02) 8333 4437/4487 Fax: (02) 8333 3055
Website: www.abc.net.au/schoolstv

Secondary Science Programs

Various ABC Schools Television programs are broadcast weekdays between 10.20 am–12 noon. Program details, schedule dates and times are on the ABC Schools Television website.

2004 Secondary Science Programs on in February–June include:

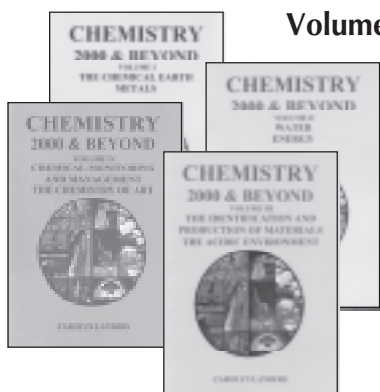
- Salinity: Australia's Silent Flood*
- Photonics – The Revolution in Communications
- World Environmental Changes
- Hazards, Disasters & Survival
- Scientific Eye
- WaterWorks*
- Science Bank*
- Inside out
- Living Australia
- Our Earth*

(* Teacher's resource materials available for these)

Chemistry 2000 & Beyond

Volumes I–IV (PLUS Teachers' Manuals I–IV)

by Carolyn Landers



Preliminary Course (Volumes 1 & 2) & **HSC Course** (Volumes 3 & 4) books were written specifically for the Chemistry Stage 6 Chemistry Syllabus.

Texts available: Vol I–The Chemical Earth, Metals; Vol II–Water, Energy; Vol III–The Identification & Production of Material, The Acidic Environment; Vol IV–Chemical Monitoring & Management, Chemistry of Art.

Each volume contains text, exercises, assignments and practical activities, plus an extensive list of websites, and has an accompanying **Teachers' Manual** which contains answers to the questions in the texts, resources and a teaching program.

Cost*: Vol 1 & 2 – \$27.50 ea, Vol 3 & 4 – \$32.50 ea. Teachers' Manuals – \$15 ea. (* Prices include postage.)



ENQUIRIES/ORDERS: ODLUM & GARNER

PH/FAX: (02) 9939 6107, PO BOX 442, HARBORD 2096

★ SPECIAL PRICE ★

Human Disease

by

E Sakker, C Odlum & R Garner

A great resource for Stage 6 Biology Core 9.4 AND Stages 4–5 Core section 5.8.4(b), which covers a wide range of diseases of humans, with in-depth studies of many of them. The major areas covered are the different types of pathogenic organisms, protection and immunity,

infectious diseases, and non-infectious disease. There are 17 practical exercises suitable for use in years 7–12.

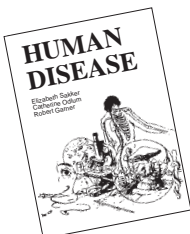
Human Disease (4th Ed) by Sakker, Odlum & Garner is available FOR ONLY \$16.00 (incl postage) (rrp: \$17.95). Further discounts for bulk orders.



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PH/FAX: (02) 9939 6107, PO BOX 442, HARBORD 2096

Odlum & Garner books are produced by Science teachers for Science teachers and their students.



IT'S WORTH SAVING WATER



SCIENCE EVENTS 2004 AT SYDNEY UNIVERSITY

Feb 29: Science Transition Workshop for new students*

Mar 24: Sydney Science Forum 1*

April 2: Career Adviser and Teachers' Day#

April 7: Sydney Science Forum 2*

April 14, 15, 16: Gifted and Talented Discovery Program 1*

April 14 & 16: Degree In A Day#

May 19: Sydney Science Forum 3*

June: Olympiad Training Begins*

June: Careers Advisors' & Science Teachers' Breakfast*

July 14, 15, 16: Gifted & Talented Discovery Program 2*.

Aug 3–5: Science in the City–High Schools§

Aug 10–12: Science in the City–Primary Schools§

August 15: Science in the City – Open Day§

Aug: Sleek Geek Week (Sydney & Orange)*

Aug: Annual Physics Competition. Ph 9351 3201

Aug 28: Courses & Careers Day#

Sept 15: Sydney Science Forum 4*

Oct 12: Postgraduate Information Sessions*

Oct: Sydney Science Forum 6*

* Enquiries: ph 9351 5268

Enquiries: ph 1300 36 2006

§ Enquiries: ph 9320 6233

HSC statistics: Entries for science courses and options at the 2003 HSC

The total number of entries for the HSC Science courses* in 2003 was 36 569 and the total number of HSC entries for the 2003 HSC was 64 781. So science entries were 56.5% of the total entries.

In 2002, there were 36 178 science entries, which were 55.8% of the total entries. In 2001, there were 36 372 entries in HSC science courses which represented 58% of the total HSC entries. The numbers in science courses were 40 010 in 2000, 41 249 in 1999, and 40 462 in 1998.

The percentage of science entries has not varied greatly since 1998, but is still much lower than the peak of 54 414 in 1992 which was 90.8% of the total candidature that year[#].

The pattern of options presented at the 2003 HSC for each Science course is given as a percentage in the following tables.

Biology	
Total 2003 candidature 12 257 (♂ 4 211 ♀ 8 046)	
Q28. Communication	52.1%
Q29. Biotechnology	5.9%
Q30. Genetics: The Code Broken?	23.8%
Q31. The Human Story	18.1%
Q32. Biochemistry	0.1%
	100.0%

Physics	
Total 2003 candidature 9 546 (♂ 7 030 ♀ 2 516)	
Q28. Geophysics	1.1%
Q29. Medical Physics	24.3%
Q30. Astrophysics	24.9%
Q31. From Quanta to Quarks	46.1%
Q32. The Age of Silicon	3.6%
	100.0%

When you point your finger at
 someone else, you are pointing the
 other three fingers at yourself.
 ... Anon

- * 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 are the number of HSC entries for each subject as of September 2003. 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.]

Chemistry	
Total 2003 candidature 9 348 (♂ 4 960 ♀ 4 388)	
Q28. Industrial Chemistry	32.3%
Q29. Shipwrecks, Corrosion and Conservation	50.1%
Q30. The Biochemistry of Movement	2.3%
Q31. The Chemistry of Art	4.1%
Q32. Forensic Chemistry	11.1%
	99.9%

Earth & Environmental Science	
Total 2003 candidature 1 212 (♂ 645 ♀ 567)	
Q28. Introduced Species & the Australian Environment	69.5%
Q29. Organic Geology – A Non-renewable Resource	12.2%
Q30. Mining and the Australian Environment	7.3%
Q31. Oceanography	10.9%
	99.9%

Senior Science	
Total 2003 candidature 4 178 (♂ 2 451 ♀ 1 727)	
Q28. Polymers	4.1%
Q29. Preservatives and Additives	7.2%
Q30. Pharmaceuticals	16.5%
Q31. Disasters	63.6%
Q32. Space Science	8.5%
	99.9%

Distinction Cosmology: Total 2003 Candidature was 28 (20 males, 8 females). (This course is part of the total science entries.)

These tables were prepared by Robert Garner using data provided by Board of Studies, Feb 2004.



The University of Sydney

11th Biennial Science Teachers' Workshop STW2004: The HSC Physics Syllabus – Moving up the Learning Curve

17 and 18 June 2004 at The University of Sydney

These two-day workshops, run by the School of Physics and Science Foundation for Physics, will again look at the newer areas of the HSC Physics syllabus. Lectures and hands-on sessions will cover content and provide practical ideas and resources that will be of use in the classroom. Registration will cover lunch, refreshments, the conference dinner, the session write-ups, and a copy of the book of the lectures given at the 2003 International Science School.

The Workshop will be held at The University of Sydney on 17 and 18 June, and will cost \$275 (incl GST) for two days, or \$220 (incl GST) for one day. Up to two regional workshops will be held.

See www.physics.usyd.edu.au/stw2004 for details and registration forms from late March, or contact:

Dr Jenny Nicholls
Executive Officer

Science Foundation for Physics
School of Physics A28, University of Sydney NSW 2006
Phone: 02 9351 3622 Fax: 02 9351 7726
Email: scifound@physics.usyd.edu.au

Photo Spot

Data Tracks on the Surface of a CD

Images and article are by Tony Romeo
Electron Microscope Unit, The University of Sydney

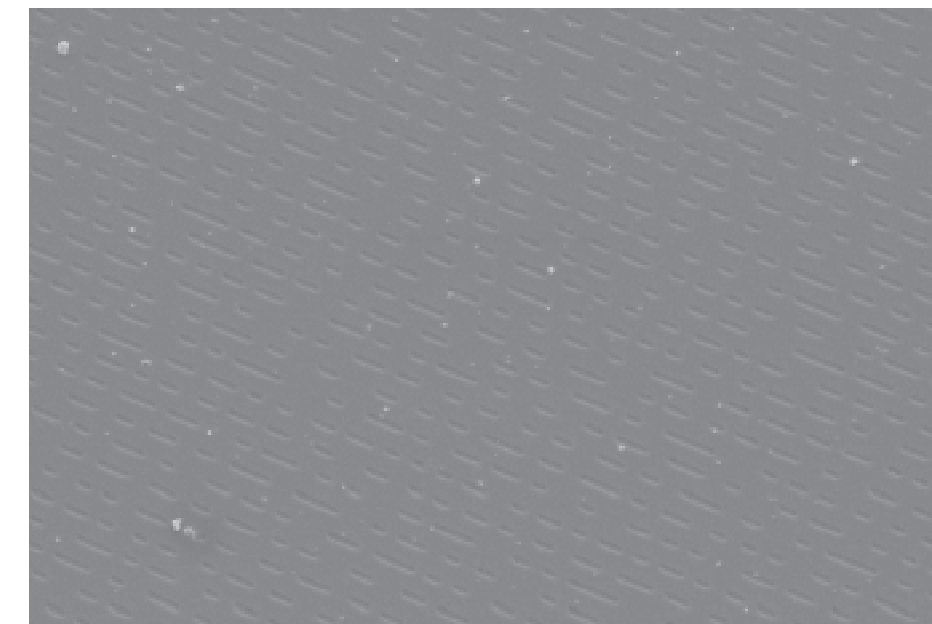
CD technology has changed the way we listen to, record and store music in recent times.

In many ways it is similar to the old records that a lot of us (OK – some of us) grew up with, but instead of using a stylus to ‘read’ the information laid out in a microgroove pressed into the record surface, the CD uses laser light to optically read a pattern of ‘pits’ and ‘lands’.

The ‘pits’ and ‘lands’ are stamped into a blank polycarbonate CD surface in a spiral from the centre of the disk outwards ... if this spiral was stretched out in one straight line it would extend for over six kilometres!

A thin layer of aluminium is then deposited over this to help reflect the laser light and finally a layer of lacquer is added to protect the surface from scratches and dust (which is almost inevitable once the CD comes out into the ‘real world’, and as can be seen by the small white spots on the CD’s surface in these photos).

When a laser light is directed at the disc it reflects from the lands and is diffused by the pits and it is this variation in intensities that contains the information that is ‘read’ and allows us to listen to our favourite music. Contrary to popular belief, the pits and lands do not themselves equate to the 1’s and 0’s



SEM photograph of the data tracks on the surface of a CD. The smallest bar is about 1 µm long.

used in the binary code of computers that is used to trigger switches on and off, but rather it is the transition from a string of pits or lands that signals the change from a 1 to a 0, or vice-versa.

This image is taken from a CD just after

it has gone through the stamping process, but before it has been lacquered. This allowed us to image the pits (and lands between them) on the surface. For the SEM, the specimen was coated with a gold layer of about 20 nanometres to make it conductive. □

FUN PARK EXCURSION

2004 DATES*
Luna Park opens in April.
So come in Terms 2, 3 or 4.
Dates are: May 4, 7. June 2, 4. August 16, 20. Sept 14, 17, 20. Oct 22, 25, 26, 27. Nov 1, 2, 3, 15, 16, 19, 23, 24, 66, 30. Dec 1, 2, 3, 6, 7.

***Note: Other school days are available by arrangement.**

OPERATING HOURS
LUNA PARK SYDNEY: 11 am–6 pm

COST SPECIAL EDUCATION PRICES
\$12.70*/secondary student
\$12.70*/primary student
plus \$17* booking fee/school
Teachers **FREE:**
1/20 secondary students
1/10 primary students
Extra teachers: \$19.00* each

* plus 10% GST (schools can claim this back as this is a curriculum-specific excursion).

★ Book NOW – don’t miss out! ★



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 based on their earlier science excursions at Luna Park. Robert has conducted Physics is Fun since its inception ... both at Luna Park (1983–1987 and 1995) and at Wonderland Sydney (1990–2003). With the closure of Wonderland Sydney in 2004, these Fun Park Excursions will return to Luna Park Sydney which is due to open in April 2004.

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

*A fun-filled educational day.
Hands-on learning is great fun!*

Save \$\$\$... special DISCOUNT SCHOOL PRICES

Any faculty can book a FUN DAY at Luna Park through Physics is Fun and save \$\$\$.

Bookings are being taken now. Numbers are limited, so minimal queues are guaranteed!

Come and join us for a fun-filled educational excursion to LUNA PARK Sydney. Interactive learning is a great way for your students to discover that forces, energy and motion are not so dull after all!

These excursions are presented by experienced Science teachers, to support and promote excellence in Science.

WORKSHEETS ...secondary/primary

Secondary: Junior Science, Physics, Biology, Senior Science, Design & Technology

Primary: Science & Technology, English, & Mathematics

ENQUIRIES/BOOKINGS

Book now by ph/fax/email, then send a deposit of \$117 (+ GST) to confirm your booking and receive your worksheets.

Robert Garner or Catherine Odium
PO Box 442, Harbord 2096

Ph/fax: (02) 9939 6107
Email: robertgarner@mac.com

Physics is Fun – The original and best
ABN 54 942 891 924

Past HSC Questions & Answers

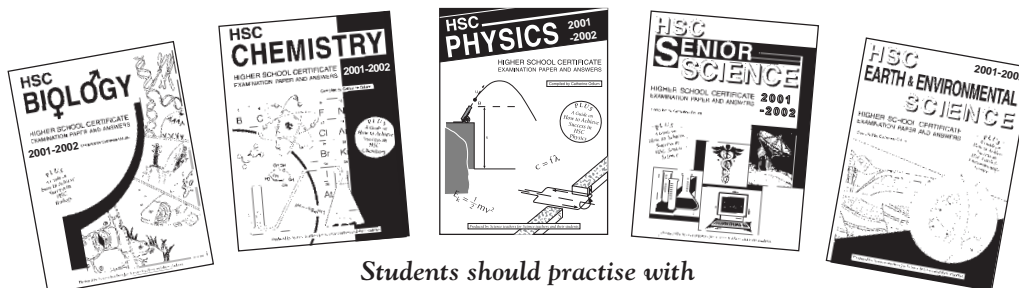


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Students should practise with
REAL HSC QUESTIONS to **ACHIEVE SUCCESS IN THE HSC.**

Price: Biol/Chem/
Phys ... \$19.95 ea
Senior Science &
EES ... \$24.95 ea

Each title contains:

- a complete copy of the 2001–2002 HSC Exams **PLUS blank answer spaces for ALL questions** (incl. all MC & Options)
- complete **WORKED ANSWERS** that would gain full marks (i.e. Band 6) to **all the Core & ALL Option questions** ... with **EXPLANATIONS** for all multiple choice answers. Includes all diagrams, graphs as in the actual HSC, etc.
- Periodic Table, Data Sheet (Phys/Chem), Formulae Sheet (Phys), Geological Time Scale (E&ES).
- a comprehensive guide on **HOW TO ACHIEVE SUCCESS IN THE HSC** for each science subject This includes essential exam techniques and how to study effectively to help students maximise their marks in the HSC.
- a **GLOSSARY OF EXAMINATION TERMS**.

BUY DIRECT
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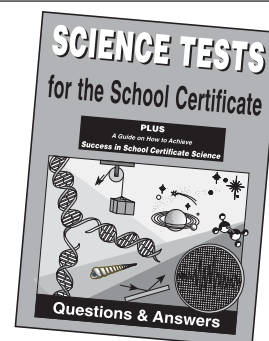
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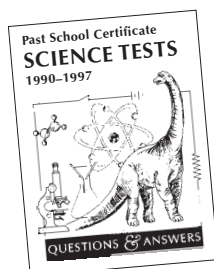
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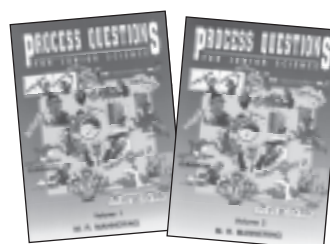


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Food additives

Introduction

People often think of food additives as harmful and unnecessary – they are chemicals and therefore they are automatically harmful. However, ‘natural’ foods are made of chemicals, so this logic is flawed.

Obviously chemicals that are used as food additives should be fully tested to show that they are harmless before being permitted. The question then arises as to what are food additives. They can be thought of as something added to a food that is not intrinsically part of the food. This definition is easy to use in foods such as milk, fruit and meat, where the product marketed is in a form similar to that produced. In more processed foods this definition is not so easy and what is an ‘essential’ part of the food or an ‘ingredient’ and what is an ‘additive’ needs to be known.

Some ‘natural’ chemicals are harmful

Many people assume that if it is ‘natural’ it is ‘OK’. But this is not always the case.

Many ‘natural’ products are also poisons. For example, in 400 BC, Greek mercenaries became intoxicated and unconscious after eating honey which had been produced from pollen collected from rhododendrons. The pollen contained a poison which was transferred to the honey. In 1598, members of a polar expedition became extremely ill after eating bear’s liver which contained high concentrations of vitamin A which is toxic to our bodies in large doses. Garlic is fatal in high doses, and the fatal dose of nutmeg is about two whole nuts.

Why have additives?

In a ‘perfect’ society there would be no need for additives as we would all eat fresh foods. However this is not the case, and food additives have been used by humans for centuries. Salt, sugar and vinegar were among the first and were used to preserve foods. Ethylene was used to ripen bananas in ancient China. Wines from Gaul were artificially coloured and

flavoured back around 23–79 AD. Spices have been used as antioxidants when no refrigeration was available. Unintentional use of additives has also occurred, e.g. almond icing used on fruit cakes for its flavour in fact contains benzaldehyde which reacts with oxygen in the air to form benzoic acid which is a known and permitted preservative and so the cake was preserved by the ‘icing’.

In the past 30 years, however, with the advent of processed foods, there has been a massive explosion in the chemical adulteration of foods with additives. Additives are needed to keep the appearance of food from changing. For example, additives such as carboxymethyl cellulose ensure that icecream remains creamy even after a few days of storage and does not turn into a solid iceblock, sodium nitrite gives bacon its characteristic pink colour and prevents the growth of harmful bacteria such as *Clostridium botulinum* in it.

Foods today are often produced a long way from their point of consumption. Food additives are needed to prevent the loss of food quality. Losses of foodstuffs between farm and table, due to microbiological deterioration, are very high and even in modern countries such as Australia the high incidence of food poisoning indicates the extent of this threat. The incidence of food poisoning would be much greater without preservatives.

Problems with food additives

Considerable controversy has been associated with the potential problems and possible benefits of food additives. Most food additives are considered safe. However, some are known to be carcinogenic or toxic. Hyperactivity in children, allergies, asthma, and migraines are often associated with adverse reactions to food additives.

Permitted additives

Since 1987 Australia has had an approved system of labelling for additives in packaged foods. Each food additive has to be named or numbered. The numbers are the same as in Europe, but without the prefix ‘E’.

The permitted list of additives is published as The Food Standards Code. Some additives are strictly controlled and only permitted in a few foods while others are allowed in a wide range of foods and in more liberal amounts. The major groups of food additives are preservatives, colourings, flavourings, antioxidants, artificial sweeteners and their bases, vitamins and minerals, modifying agents such as vegetable gums, mineral salts, food acids, emulsifiers, humectants and thickeners.

There are regulations and procedures that must be followed before a substance can be classified as a permitted additive. Additives are allowed in food only after they have been fully tested, shown to be safe, and placed on the official listing (permitted list) of the foods in which they are allowed. The testing is rigorous and the cost of the research to show that an additive is safe must be borne by the additive manufacturer.

Research to show the additive is safe must include tests in which animals are given the additive, mixed with their diet, but at much higher concentrations than will occur in human food. The tests are designed to give information on any possible effects from short-term or long-term exposure to the proposed additive, including whether it may have any potential to cause cancer, or to affect reproductive processes or the development of the embryo or the foetus if consumed by a pregnant woman. Tests are also carried out to assess its ability to interfere with genetic material in the body, which could lead to the development of cancer or adverse effects in future generations.

The results of the safety tests are assessed by independent experts - independent, that is, of the additive manufacturer or the food manufacturer - and used to calculate the Acceptable Daily Intake (ADI) for humans. The ADI is defined as: ‘an estimate of the amount of the food additive, expressed on a body weight basis, that can be ingested daily over a lifetime without appreciable health risk’ and is expressed on a milligram per kilogram body weight per day basis (mg/kg w/day). The ADI concept is used extensively by regulatory bodies throughout the world, such as the US Food and Drugs Administration (FDA), the World Health Organisation (WHO) and the European Community (EC) to confirm that ingestion of all additives remains within safe levels. It applies to people of all ages, children as well as adults.

Despite all the care taken there is still controversy over the use of additives – partly because animals are used in such trials, and also because it is difficult to take into account the individual differences in intake of various food substances by people.

So we are often left with the question over whether a chemical is considered safe or not, and who will affect or not?

* * * * *

[Sources: ‘Food Additives’ by Anne Molloy, *Lab Talk Oct 1995* and the websites: <http://www.faia.org.uk/choice.php>, <http://www.x-sitez.com/allergy/additives/index.html>]

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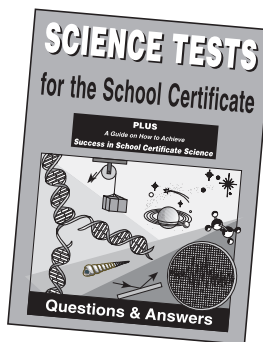
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For details about this book, and/or to order it ... see page 7.

Science on the Web

Some interesting websites to visit:

- **'The Mind'**

<http://www.bbc.co.uk/science/humanbody/mind/>
At this BBC site you can find out more about how the mind works and try different tests to see how your own mind works.

- **Academy's Nova: Science in the News**
www.science.org.au/nova/

New topics are added regularly, about 78 topics now - with information, glossary, activities, further readings, web links, etc. Some of the latest topics include: 'Stem cells - gateway to 21st century medicine', 'Nanoscience - working small, thinking big', 'Salinity - the awakening monster from the deep', 'Coral bleaching - will global warming kill the reefs', 'Synchrotrons - making the light fantastic', plus many more.

Science Updates

Lemmings' myth finally understood

Scientists decades ago debunked the myth that lemmings commit mass suicide when their numbers grow too large. After 15 years of research with collared lemmings in Greenland, they have discovered that the combined actions of four predator species - snowy owls, long-tailed skuas (a type of seabird), arctic foxes and stoats - create the four-year cycles during which lemming populations explode and then nearly disappear. They found that when lemming populations increased, the foxes, skuas and owls began to eat them in a much greater quantity thus causing their population size to shrink rapidly.

[Sydney Morning Herald 3/11/03]

Think twice before you next eat flake

Australia is home to more than 300 species of sharks and rays (the *Elasmobranches*). Virtually all species pose absolutely NO threat to humans at all, yet we indiscriminately kill millions of them each year. Elasmobranches are now in serious decline around the world.

- **The Particle Adventure**

<http://particleadventure.org/particleadventure/>
Discover about the fundamentals of force and matter - this is an interactive tour about quarks, neutrinos, antimatter, extra dimensions, dark matter, accelerators, and particle detectors. It is informative and worth visiting, but allow time as it is slow to navigate.

- **Music acoustics from UNSW**

<http://www.phys.unsw.edu.au/music/>
Physics and music have been closely related for thousands of years. This site presents, in musician-friendly format, some of the basics as well as research work in music acoustics. Great site if you are teaching about the physics of sound or just for your general knowledge.



Please note ... any links to an organisation, service or product do not indicate a recommendation or endorsement for them. The above websites were active at the time of printing, so apologies in advance for any changes to URLs.

Several Australian species are listed as threatened and many others are of conservation concern. Commercial and recreational fishing are by far their greatest known killers.

[Australian Marine Conservation Society Poster]

Shrinking Antarctica

Australian scientists have found that the Antarctic coast is shrinking markedly - that more than 500 000 km², or about one-fifth of the region, which was once solid ice is now open water.

[Sydney Morning Herald 14/11/03]

Largest animal ever known

Blue whales (*Balaenoptera musculus*) are the largest animals known, either living or extinct. Two species are known to exist in southern hemisphere waters. Blue whales are bluish-grey, mottled with whitish spots and have white undersides. Females calve every 2-3 years, newborns are 6 m long at birth and have a 12 month gestation. They are sexually mature between 5-10 years. Adult males grow to about 25 m and females up to 30 m.

[Ecos 113 Oct-Dec 02]



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- **Chemistry and Biochemistry**

Aimee Williams, Woollooware High, NSW, 'Analysis of ethanol in petrol by gas chromatography'.

- **Environmental and Earth Science**

Andrew Stewart, Karabar Dist Ed Ctre, NSW, 'Nutrient Runoff - How can swamp plants improve our water?'

- **Physics, Engineering and Technology**

Kaitlin McGinnis, St Mary's Anglican Girls School, WA, 'Orthokeratology'.

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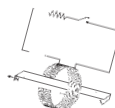
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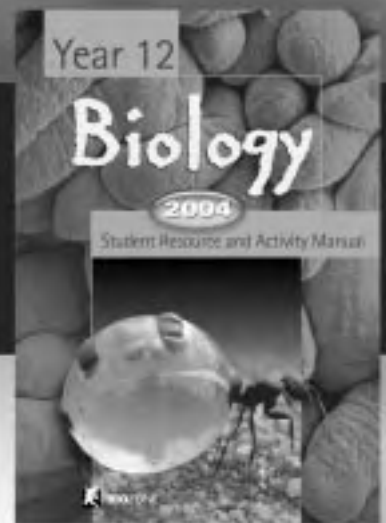


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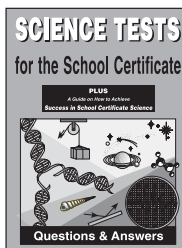
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