FEBRUARY 2015

Scientrific®

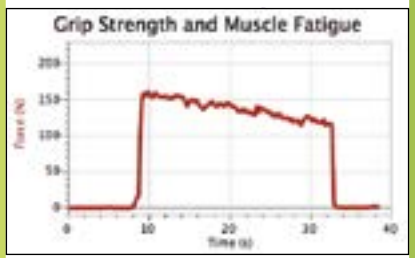
Science Education Resources

Pull out sections for sharing in different departments:
SCIENCE - SPORT - HPE - STEM

DATA LOGGING – SCIENCE, HPE AND SPORT FEATURE

Vernier Accelerometers

Vernier Hand Dynamometer



Vernier Goniometer

See inside for specials, Lab Equipment plus innovative Biology, Chemistry and Physics products

SEE WEBSITE FOR DETAILS
scientrific.com.au

Hand-Grip Heart Rate Monitor ○

The wireless transmitter allows freedom of movement making this sensor ideal for monitoring heart rate even while exercising.
HGH-BTA

PHYSIOLOGY EXPERIMENTS:
- Relating physiological functions with physical activity
- Heart rate and physical fitness
- Heart rate as a vital sign
- Effect of coughing on heart rate
- Heart rate and body position
- Response to baroreceptor feedback

Vernier EKG Sensor ○

Use the EKG Sensor to measure electrical signals produced during muscle contractions.

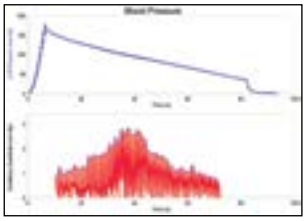
Make 3 lead EKG recordings of electrical activity in the heart.

Collect surface EMG recordings to study contractions in muscles in an arm, leg or jaw.
EKG-BTA

PHYSIOLOGY EXPERIMENTS:
- Relating physiological functions with physical activity
- Heart rate, blood pressure and exercise
- EMG and muscle fatigue

Blood Pressure Sensor ○

The Blood Pressure Sensor uses an inflatable pressure cuff around the arm and a sensor to measure human blood pressure. It measures systolic, diastolic and mean arterial pressure and pulse rate.
BPS-BTA



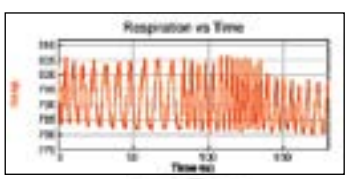
Pictured: Blood Pressure Sensor, LabQuest 2, Logger Pro software on the laptop displaying the graph above.

PHYSIOLOGY EXPERIMENTS:
- Ventilation and Heart Rate
- Control of human respiration
- Relating physiological functions with physical activity eg the effect of exercise on blood pressure

Vernier Respiration Monitor Belt ○

Used to measure human respiration by monitoring the expansion and contraction of the chest during breathing. Uses an inflatable belt.

Requires the Vernier the Gas Pressure Sensor.
RMB Respiration Monitor Belt
GPS-BTA Gas Pressure Sensor

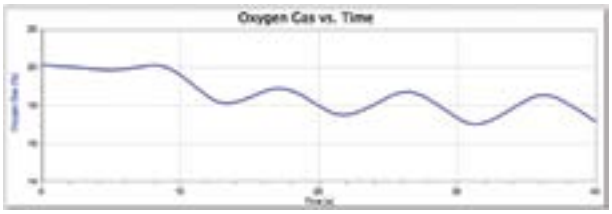


PHYSIOLOGY EXPERIMENTS:
- Relating physiological functions with physical activity
- Ventilation and Heart Rate
- Control of human respiration

Vernier Spirometer, O_2 & CO_2 Sensors ○

Combine the Sprirometer, O_2 and CO_2 gas sensors to examine respiration, O_2 & CO_2 levels, air flow, lung volume and the effects of exercise.

Optional adapter allows the measurement of O_2 concentration and flow rate of exhaled air.
SPR-BTA, O2-BTA, CO2-BTA and O2-SPR



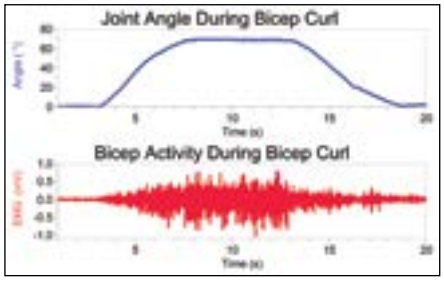
PHYSIOLOGY EXPERIMENTS:
- CO_2, O_2 and human respiration
- Oxygen and aerobic metabolism
- Oxygen extraction by the lungs
- Control of Human Respiration
- Analysis of lung function
- Effect of "dead space" on oxygen availability
- Relating physiological functions with physical activities
- Lung volumes and capacities
- Oxygen and aerobic metabolism

Vernier Goniometer ○

Used to measure the dynamic motion of a limb or other objects. Use it with an EKG Sensor to measure muscle activity during limb motion.

The sensor is detachable from the base plate and arms for use in STEM and engineering activities. **Range**: 0 to 340° (±170°)
GNM-BTA

See in-use pictures on back cover



Measuring joint angle & muscle activity with a Goniometer and EKG.

PHYSIOLOGY EXPERIMENTS:
- Monitor joint angle
- Determine range of motion
- Muscle function analysis
- Use with an EKG Sensor to measure motion and muscle activity during limb motion

Vernier Surface Temperature Sensor ○

Extremely rapid response time, designed for use in air, water and for measuring skin temperature.
STS-BTA

PHYSIOLOGY EXPERIMENTS:
- Skin temperature measurements
- Human respiration studies

○ Use with a Vernier LabQuest, LabQuest 2, LabQuest Mini, Go!Link, SensorDAQ, EasyLink or LabPro.

Feb 2015

Due to the volatility of the Australian dollar we have not printed prices however all prices can be found on our website.

Scientific®
Science Education Resources

Vernier International

Horizon Educational

TERM 1 2015 BACK TO SCHOOL ESSENTIALS

Lab Essential
Adam Electronic Balance

Great student balance 200x0.1g
DCT201 ~~$95~~ **$68**

Lab Essential
Vacuum Pump

Make water 'boil'
SC8012 ~~$495~~ **$395**

Lab Essential
IEC Power Supply

Australian made, with cables
LB2629C ~~$155~~ **$119**

Electrostatics
IEC Van de Graaff

Latest model, true variable speed
EM4134-101 ~~$480~~ **$450**

Physics
Alnico Bar Magnets

Pair 75x10x15mm with keepers
SC6030 $11

Physics
Super Magnets 22x10mm

SC4400N $10 each, unsleeved
SC4401N $13 each, sleeved

Physics
Super Magnets 28.2x19mm

SC5881 $17 pair, unsleeved
SC5882 $23 pair, sleeved

Physics
Alnico Horseshoe Magnet

50x55x19mm (HWD), pole gap 30mm **SC6031** $13

Lab Essential
IEC Rhumkorff Coil

Australian made Induction Coil
EM3450-001 $303

Lab Essential
Dust Coats

See website for sizes
SC4981 $25 each

Lab Essential
IEC Hot Plates

CH1922-001

CH1920-001 ~~$250~~ **$199**
CH1922-001 ~~$315~~ **$265**

Lab Essential - IEC
Magnetic Stirrer / Hot Plate

CH2092-001

CH2090-001 ~~$415~~ **$365**
CH2092-001 ~~$480~~ **$430**

Physics
UV Beads

Colour changing UV beads
SC1093 $10

Physics
Shaky Torch

Shaky (Faraday) LED Torch
SC92029 $10

Physics
UV and White LED Torches

White LED **SC92025** $5
UV LED **SC92022** $8

Physics
IEC Hodson Light Box

Genuine Australian made
HL2060-001 ~~$111~~ **$92**

FAX ONLY Order Line 1800 171 805

Prices do NOT include GST. Specials valid while current stock remains otherwise to April 30th 2015.

Feb 2015
SEE WEBSITE FOR DETAILS
scientrific.com.au

Classic Media Autoclaves

- Do you need to sterilise liquids and media?
- Do you currently use a standard pressure cooker for sterilisation?
- Do you use a naked flame as the heat source?

lab safety check

If you answer yes to any of these, then a Prestige Autoclave with safety interlock lid is the solution.

the science
the facts
the figures

NEW

Using a domestic pressure cooker for sterilisation can represent a serious risk if used incorrectly.

- they have no temperature or time controls which could result in ineffective sterilisation
- risk of boiling dry if left unattended
- if placed on a tripod or heated over a Bunsen burner, they are vulnerable to being knocked over
- without the benefit of a safety locking mechanism, they can be opened prematurely whilst the temperature inside is still high enough for thermal shock to cause glass vessels to explode

Classic Media autoclaves remove these risks, ensuring that you protect your staff and pupils from the risk of injury and also guarantees safe and easy sterilisation.

Available in two sizes, ideal for a variety of laboratory processes, will fit neatly on a work-bench, is easy to operate and is mains powered.

Optional printer for quick and easy data recording.

SC210047 **$1644*** 9 litre
SC210048 **$1989*** 12 litre
SC279521 **$541*** optional printer
SC279505 **$95*** pack 10 printer rolls

*Prices subject to change, check website for current prices

Vernier Fan Cart

NEW

Pictured: Encoder Fan Cart on Encoder Track, LabQuest Mini, laptop running Logger Pro and engaged students.

Consists of a large 3 speed fan on a lightweight cart for constant acceleration, variable mass, thrust and thrust angle experiments. To measure angles the fan turns on a protractor base.
A sail is included and can be mounted in 2 positions to perform fan-on-a-sailboat experiments. With two mass bars.
CART-F **$ see website***

Variations

- **CART-F** Fan Cart for old non-Encoder Dynamic Tracks
- **CART-FEC** Encoder Fan Cart, use with an Encoder Track
- **FECT** Encoder Fan Cart Upgrade, upgrades a Fan (CART-F) Cart to Encoder Fan Cart (CART-FEC)

*Prices subject to change, check website for current prices

Vernier Structures Tester

NEW

Load Cell Range:
0 to 1000N
Max displacement:
7cm
Resolution: 0.1 mm

The Vernier Structures & Materials Tester is the perfect device for all STEM and engineering labs. With a load cell and displacement sensor for recording the maximum load and load displacement and analysing stress and strain.

Additional shipping charges apply due to size and weight.
VSMT **$ see website***

Use for:

- Beam design and testing
- Truss design and testing
- Bridge competitions
- Analysis of structures
- Investigating strength of materials
- Determining modulus of elasticity

Prices subject to change, check website for current prices

FEBRUARY 2015

Scientrific®

Horizon Educational

www.scientrific.com.au
ABN 056 072 694
Phone 02 6645 8111
Fax 02 6645 8125

Scientrific has recently been appointed as the sole Australian distributor for Horizon Educational products. Details on how we feel Horizon Educational products relate to the Australian Curriculum are below.

Horizon SCIENCE Curriculum Links - Years 6 to 10 and 11 - 12

Identifiers for Horizon products that we feel align to the Australian Curriculum Science*:

Chemical Sciences: ● **Physical Sciences:** ● **Earth and Space Sciences:** ● **Senior Chemistry:** ■ **Senior Physics:** ■

For full documentation of how we see Horizon products fitting the Australian Curriculum go to: www.scientrific.com.au/document.php?d=207

STEM studies (●)

Horizon products provide a platform for designing and testing solutions to problems while learning about scientific concepts and engineering principles. They are well suited to Science Technology Engineering and Mathematics (STEM) studies within an alternative and renewable energy context.

Year	Chemical Sciences	Physical Sciences	Earth and Space Sciences
6		ACSSU097; ACSSU219	
7		ACSSU117	ACSSU222
8	ACSSU225	ACSSU155	
9	ACSSU178; ACSSU179	ACSSU182	
10	ACSSU187	ACSSU190; ACSSU229	

Subject	Unit	Topics	Scientific Understanding
Senior Chemistry	1. Chemical fundamentals: structure, properties and reactions	Reactants, products and energy change (Electrochemical reactions)	ACSCH036; ACSCH037; ACSCH038; ACSCH039
	2. Molecular interactions and reactions	Intermolecular forces and gases (Ideal Gas volumes)	ACSCH060
		Rates of chemical reactions (Hydrogen cell)	ACSCH068; ACSCH069; ACSCH071; ACSCH073
	3. Equilibrium, acids and redox reactions	Oxidation and reduction (Electrochemical cells)	ACSCH103; ACSCH104; ACSCH106; ACSCH107; ACSCH108; ACSCH109; ACSCH110; ACSCH111
	4. Structure, synthesis and design	Chemical synthesis and design (Bio. fuels)	ACSCH131; ACSCH135; ACSCH137;
Senior Physics	1. Thermal, nuclear and electrical physics	Heat processes (Mechanical systems)	ACSPH025
		Electrical circuits (Energy and power)	ACSPH037; ACSPH038; ACSPH039; ACSPH040; ACSPH041; ACSPH042
	2 Linear Motion and Waves	Linear motion and force (Energy conservation)	ACSPH065

Horizon Fuel Cell Car Science Kit ● ● ● ■

Learn about electrolysis and the decomposition of distilled water into oxygen and hydrogen in a solar powered fuel cell.

The reversible fuel cell can also convert the hydrogen and oxygen into electricity to power the car's electric motor.

FCJJ-11 ~~$125~~ $99

Horizon H-Racer 2.0 ●

Accurately reflects how hydrogen cars and refuelling stations work.

Includes a solar panel to power the fuel cell's production of hydrogen.

Infrared control guides the car once its tank is filled with fuel.

FCJJ-23 ~~$200~~ $160

IDEAL FOR STEM

Horizon Hydrocar ● ● ● ■

Hybrid technology demonstrates clean-energy solar to hydrogen power generation.

Powered by electricity from sunlight, the reversible fuel cell illustrates the principles of water electrolysis, separating hydrogen and oxygen from water and recombining them to create power in a very efficient process.

FCJJ-20 ~~$142~~ $114

Horizon i-H2GO

iOS 4.3+
SAMSUNG*

● ● ●

The solar powered hydrogen refuelling station generates hydrogen and oxygen through electrolysis.

The car's fuel cell then converts the gasses to electrical energy to drive the motor, the super capacitor engages when the car accelerates. Steer the car with your smart phone*, iPAD+ etc.

FCJJ-25 ~~$246~~ $189

FAX ONLY Order Line 1800 171 805

Prices do NOT include GST. Specials valid while current stock remains otherwise to April 30th 2015.

SEE WEBSITE FOR DETAILS
scientrific.com.au

Identifiers for Horizon products that we feel align to the Australian Curriculum Science*:
Chemical Sciences: ● **Physical Sciences:** ● **Earth and Space Sciences:** ● **Snr. Chemistry:** ■ **Snr. Physics:** ■

Horizon Ethanol Fuel Cell Science Kit

Discover the principles of converting ethanol into electrical energy through oxidisation.

Mix ethanol and water and feed it via silicon tubing to the fuel cell where it is converted into electricity to power the electric fan.

FCJJ-42 ~~$243~~ $212

Horizon Salt Water Fuel Cell Science Kit

Demonstrate a cutting edge fuel cell technology: combine salt water with magnesium plates to generate electricity to power the included motor / fan or your own devices.

Develop micro-fuel cell applications.

FCJJ-34 ~~$122~~ $106

Horizon Solar Hydrogen Education Kit

A solar panel powers a PEM fuel cell to split distilled water into hydrogen and oxygen by electrolysis. The fuel cell can then convert the hydrogen and oxygen into electricity to power your equipment.

Students can invent their own clean energy devices. To get them started a small motor and propeller is included.

FCJJ-16 ~~$129~~ $103

Horizon Wind Energy Science Kit

Build a mini wind turbine like those on a wind farm. Wind curriculum covers horizontal and vertical axis turbines.

With 9 uniquely designed blades based on NASA aeronautics. Experiment with blade pitch (3 positions from 0° to 55°) and blade number. Find the perfect balance between weight, wind resistance and angle.

FCJJ-39 ~~$174~~ $152

Horizon Wind to Hydrogen Science Kit

Turn wind power into hydrogen energy.

Demonstrate the principles of wind energy, hydrogen fuel cells, electrolysis and basic electronics.

Use the motor to drive the included fan or to drive your own models.

FCJJ-56 ~~$291~~ $254

Horizon Bio-Energy Education Science Kit

Discover the principles of converting ethanol into electrical energy through oxidisation.

Run a fan for hours off a mix of 10% ethanol and 90% water.

Seven experiments including the use of beer or wine as a fuel. A one-piece working bench top model (similar to the FCJJ-42).

FCJJ-22 ~~$214~~ $171

Horizon Super Capacitor Science Kit

Discover the extraordinary storage and power potential of super capacitors.

Create electricity with the hand cranked generator and monitor energy storage with the charge level indicator.

Use the energy storage capacity and power of the super capacitor to run the included electric fan.

FCJJ-35 ~~$249~~ $218

Educational Prices shown.
Foreign exchange rate variations cause price changes. Please see website for current prices.

Horizon Renewable Energy Kit

Understand the key principles of clean energy technology by studying it in miniature.

Power your own solar powered electrical circuit. Find out the most efficient way to generate energy using a wind turbine. Separate water into hydrogen and oxygen through electrolysis and watch a fuel cell turn the hydrogen and oxygen into electrical power.

Enough hardware, software and curriculum content for group work of up to 4 or 5 students.

FCJJ-37 ~~$386~~ $338

Identifiers for Horizon products that we feel align to the Australian Curriculum Science*:
Chemical Sciences: ● **Physical Sciences:** ● **Earth and Space Sciences:** ● **Snr. Chemistry:** ■ **Snr. Physics:** ■

Horizon Micro Fuel Cell Science Kit

Power a mini turbine by converting solid state hydrogen stored in the HYDROSTIK PRO metal hydride cartridge into electrical energy with a Horizon PEM fuel cell. A model micro fuel cell system and working example of solid hydrogen storage.

Requires a source of hydrogen like the **HydroFILL PRO**.

FCJJ-44 ~~$251~~ $220

Horizon Thermal Power Science Kit

Produce power from the temperature difference between hot and cold water.

LED and fan modules show the variance in electric power being generated. Monitor temperatures with the included thermometers. Does a smaller temperature differential = less power?

Examine the physics of heat exchange and available energy.

FCJJ38 ~~$281~~ $246

Horizon Renewable Energy Monitor

Compatible with any of Horizon's science education kits and Windows or Mac using Windows Parallel or Boot Camp. Export all data to Excel or CSV format.

Record a video of experiments for playback and review.

FCJJ-24 ~~$245~~ $196

Horizon PEM Electrolysers or Fuel Cells

A pack of 5 individual Fuel Cells to convert hydrogen & oxygen to electricity. Requires a hydrogen source like the FCSU-010.
Output: 270mW @ 0.6V DC, 0.45A

FCSU-012 ~~$302~~ $264

A pack of 5 individual electrolysers that produce hydrogen and oxygen by the electrolysis of distilled water.
- Input: 1.8V ~ 3V DC @ 0.7A
- Hydrogen production: 7ml / min.

Requires gas storage containers, a power source & distilled water.

FCSU-010 ~~$234~~ $214

Pack of 5 individual **reversible** fuel cells that use electrolysis to convert distilled water into hydrogen and oxygen **OR** recombine the gasses to create electricity.
- Input: 1.8V ~ 3V DC @ 0.7A
- Hydrogen Out: max. 7ml/minute
- Output: 0.6V DC, 360mA, 210mW

FCSU-023 note colour can be blue or clear

FCSU-023 ~~$336~~ $269

Horizon Energy Box

The best choice for a complete understanding of how fuel cell technology interacts with renewable energy sources.

Harness the power of the sun, convert wind energy into electrical power, generate energy with a simple hand crank and see first-hand the incredible storage potential of a super capacitor.

There's a range of fuel cells to compare: a PEM hydrogen fuel cell, the salt water fuel cell and a direct ethanol fuel cell.

Set up experiments to see how different alternative technologies interact with each other, play with the angle of wind turbine blades, record the effect of shade on the solar panel.

Countless experiments, so many scientific principles at work and plenty of space for creativity.

For convenience the entire kit comes in a plastic storage tub.

Kit contents with storage tub

The included Horizon Energy Monitor

Some of the kit contents

FCJJ-40 ~~$1740~~ $1523

Horizon Electric Mobility Experiment Kit

Electric Mobility Experiment Set. Experiment with tomorrow's possible sustainable transport solutions.

Compare different kinds of fuel cell technology: the salt water fuel cell and two types of micro-PEM fuel cells that exploit the energy efficiency of hydrogen fuel stored in the Hydrostik Pro metal hydride cartridge.

Convert sunlight into electricity with the solar panel, change mechanical energy into electricity with the hand crank. Store electricity in the super capacitor.

Supplied in a handy storage tub

FCJJ-30 ~~$329~~ $288

Horizon HYDROSTIK PRO

A portable storage solution for hydrogen. Safe enough to take on a plane!

Instead of compressing hydrogen, the safe and reliable HYDROSTIK PRO cartridge binds hydrogen with a metal alloy to form a solid metal hydride.

LWH22-10L-5 ~~$46~~ $40

Advanced Horizon Kits for engineering projects, STEM, competitions, researchers, tertiary education and hobbyists. Could you share these pages with another department?

Horizon HydroFILL PRO

A "hydrogen on demand" desktop refuelling station designed for easy and automatic refilling of HYDROSTIK PRO metal hydride cartridges. Generates hydrogen through water electrolysis. DC or mains powered, mains adapter supplied.

Perfect for science kits and engineering projects such as EDUSTAK PRO & EDUSTAK Junior, Horizon Fuel Cell Developer Kits, the Micro Fuel Cell Energy Kit, the Electric Mobility Experiment Set, H-Cell 2.0 and the Horizon Energy Box.

FCH-020 ~~$938~~ $820

Note the HydroFILL PRO does NOT contain the pictured HYDROSTIK PRO cartridge.

Horizon H-Cell 2.0

Create your own hybrid hydrogen-electric powered equipment.

The 30 Watt H-Cell replicates the technology of real-scale hybrid vehicles which improve performance by using high energy density hydrogen fuel in addition to batteries.

Batteries provide power for acceleration, the H-Cell provides hydrogen power for cruising.

With a H-Cell the vehicle can run up to four times longer than with a battery alone. Designed with RC hobbyists in mind, it is optimized for 1:10 scale models.

FCJJ-21 ~~$1769~~ $1399

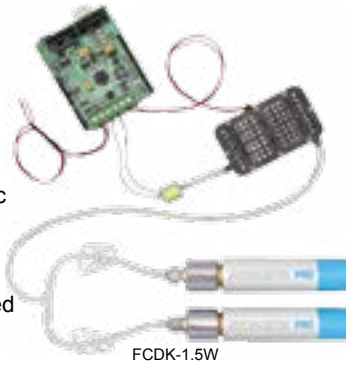
Requires a source of hydrogen like the **HydroFILL PRO**.

H-Cell 2.0 30W Fuel Cell mounted on a model car chassis. Car chassis is NOT SUPPLIED.

Horizon Fuel Cell Developer Kits

FCDK 1.5 is a basic, hands-on introduction to the principles of hydrogen hybrid technology, and enabling users to power electrical devices.

With FCDK 1.5 (1.5 Watt) you can build a whole range of basic hydrogen hybrid applications – temperature sensors, timing devices and many other electronic systems with improved efficiency.



FCDK-1.5W

The FCDK 12W (12 Watt) and FCDK 30W (30 Watt) enable a more in-depth understanding of the technology and increase the options for users.

All FCDKs require a source of hydrogen like the **HydroFILL PRO**.

Typical FCDK-12W running time from a HYDROSTIK PRO is 55 minutes thus the FCDK 12 is a great fuel source for RC cars, boats, robots, trains etc. As with all FCDK kits, the 12W comes with the Arduino development board, Hydrostik Pro metal hydride storage cartridges and all the components necessary to maximize your hydrogen hybrid system.

FCDK-12W

FCDK contents:

1. 1.5W, H-12 or H-30 fuel cell stack
2. 1 x HYDROSTIK PRO hydrogen storage (2 in FCDK-12 and FCDK-30)
3. 1 x Pressure Regulator (2 in FCDK-12 and FCDK-30)
4. Silicon tubing (30cm)
5. 1 x Silicon tubing T-splitter
6. 1 x Tube Clip
7. 1 x Purge valve
8. Red/black electrical cable Developer Kit
9. Arduino Fuel Cell Shield
10. Arduino Uno or (mbed / pi)

FCDK-30W

FCDK-1.5W ~~$911~~ $797
FCDK-12W ~~$1702~~ $1362
FCDK-30W ~~$2596~~ $2069

Horizon EduStak Junior

A 4 Watt assembled fuel cell stack that can be dismantled and re-assembled. See first-hand what is in a fuel cell 'stack'. No tools are required. Supplied in a plastic tub.

You will need a source of hydrogen like the HydroFill Pro to charge the supplied HYDROSTIK PRO cartridge with hydrogen.

Feed air and hydrogen to the fuel stack to produce electricity for powering your model cars, boats, phones, robots etc.

FCSU-32 ~~$2043~~ $1788

Assembled and charging a phone, phone is not included

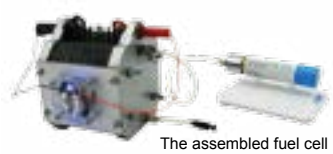
Horizon EduStak PRO

The 20 Watt fuel cell stack comes assembled. It can be dismantled and reassembled for a first-hand look at what is in a fuel cell 'stack'. No tools are required. Supplied in a plastic tub.

You will need a source of hydrogen like the HydroFill Pro to charge the supplied HYDROSTIK PRO cartridge with hydrogen.

Feed air and hydrogen to the fuel stack to produce electricity for powering your model cars, boats, phones, robots etc.

FCSU-33 ~~$2921~~ $2556



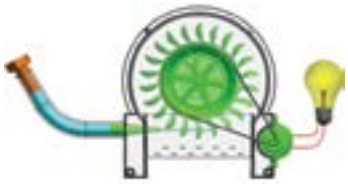
The assembled fuel cell

Kit contents

www.scientrific.com.au | sales@scientrific.com.au | Prices do NOT include GST |

Hydro-electric Generator

NEW



A very versatile and well made Hydro-electric Generator from the USA.

Produces 12V AC at 5.5 Watts when connected to mains water pressure. Supplied with User Manual, electrical leads, connecting hose, LED light strip and bridge rectifier to convert the AC into DC voltage.

Use for renewable energy studies, AC to DC conversion, physics - conversion of energy, potential and kinetic energy.

On the right are suggested experiments that we feel align with the Australian Curriculum Science - Science Understanding.

SCHEG **$299** (price dependent on exchange rate, check on website)

Australian* CURRICULUM

Year	ACSSU Code	Description	Suggested Experiments
2	32	Earth's resources, including water, are used in a variety of ways	* Explore the operation of a water wheel
6	97	Electrical circuits provide a means of transferring and transforming electricity	* Constructing simple electrical circuits * Using switches and light globes
6	219	Energy from a variety of sources can be used to generate electricity	* Investigating how moving water can turn turbines to generate electricity
7	222	Water is an important resource that cycles through the environment	* Considering whether water wheels are a sustainable energy
7	117	Change to an object's motion is caused by unbalanced forces acting on the object	* Investigate falling water as an object that can apply a force to rotate a wheel.
8	155	Energy appears in different forms including movement (kinetic energy), heat and potential energy and causes change	* Investigate conversion of gravitational potential energy to kinetic energy in different forms. * Investigate conversion of kinetic energy into electrical energy. * Investigate conversion of electrical energy into heat, sound and light.
9	182	Forms of energy can be transferred in a variety of ways through different mediums	* Investigate resistance and temperature as factors that affect the transfer of energy through an electric circuit
10	190	Energy conservation in a system can be explained by describing energy transfers and transformations	* Investigate conservation of energy and efficiency of conversion during energy conversion for a water wheel turbine.

Vernier Experiment Manuals

NEW 2015

Renewable Energy with Vernier: 26 wind and solar energy experiments (traditional and inquiry) and engineering projects.
REV **$ see website**

Investigating Wind Energy: Ten hands-on wind energy experiments for students and a wind energy engineering project.
ELB-WIND **$ see website**

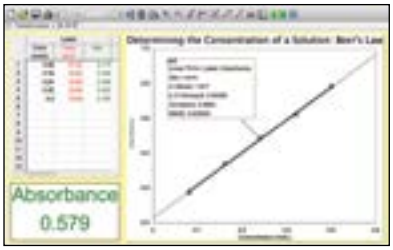
Vernier Engineering Projects with Lego NXT: Guide for students to build and program robots.
EP-NXT **$ see website**

Vernier Chemistry Investigations: With instructions for using probes and software in an inquiry environment.
APCHEM **$ see website**

Vernier - Colorimeter - New Improved

NEW 2015

WAVELENGTHS:
430 nm 470 nm
565 nm 35 nm



Beer's Law experiment

The improved Vernier Colorimeter offers better protection against spills. Features one-button automatic calibration. Includes fifteen 3.5 mL cuvettes.
COL-BTA **$ see website**

BIOLOGY:
- Using colour changes to monitor rates of photosynthesis
- The effect of alcohol on biological membranes
- Population dynamics

FORENSICS:
- Identifying an ink by its light absorbance

CHEMISTRY:
- Beer's law: find the unknown concentration
- Kinetics: rate and order of a reaction
- Rate determination and activation energy
- Chemical equilibrium: Finding Kc constant

WATER QUALITY:
- Ortho- and total-phosphates concentration
- Nitrate concentration

Scientrific®
Science Education Resources

Vernier International

Horizon Educational

FEBRUARY 2015

TERM 1 2015 BACK TO SCHOOL ESSENTIALS

Physics
Inductive Braking

How the "Tower of Terror" brakes
SC15000 ~~$235~~ **$150**

Physics
Pen Type Digital Thermometer

Temperature range -50 to 150ºC
127-1860 ~~$33~~ **$19**

Physics
Thermometer and or Tray

10 thermometers **SC92009** **$30**
Thermometers + tray **SC1221** **$53**

Physics
Joule's Calorimeter

Calorimeter Electric Double-Wall Aluminium **SC13759** **$20**

Lab Essential
IEC Oven

Exterior: 310 x 330 x 435mm
CH2251-001 **$1151**

Lab Essential
Stainless Steel Lab Trolley

Size 85 x 45 x 99cm, 3 shelves
SC9035 **$290**

Lab Essentials
Boss Head Heavy Duty

Quality German design
SC14137 **$5.50**

Lab Essentials
Stainless Tripod & Mesh Mat

SC92004 **$64** 5 tripods & mats
SC92000 **$10** each Tripod only

Biology
Monocular Microscope

Rechargeable, LED lighting
MMLED ~~$285~~ **$250**

Biology
USB Microscope

5 MP USB digital microscope
SC5135 **$115**

Biology
Slide Sets

Set 10 anatomy **SC92038** **$26**
Set 20 mixed **SC92040** **$45**
Set 25 botany **SC92041** **$65**
Set 80 mixed **SC92042** **$115**

Biology
50X Microscope

iPhone not included

Clip on to iPhone 4/5, Galaxy S3
SC5110 **$16**

Lab Essential
IEC Water Bath, needs hotplate

Bath only **CH4240-001** **$169**
Controller **CH4240-101** **$156**

Lab Essential
Deioniser

Economic alternative to a still
SC93010 **$395**

Lab Essential
Regulated Power Supply

Regulated 0 to 30 V DC, 3 amp
225-1946 ~~$113~~ **$79**

Lab Essentials
Safety Glasses and Storage

SC4955 **$3.80**,12+ **$3.50** ea.
SC9010 **$25** **$20** *Storage*

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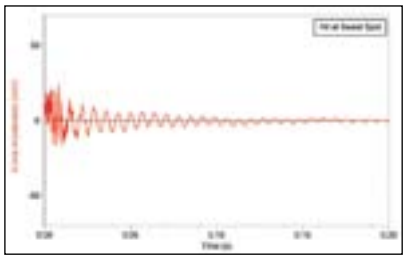
Prices do NOT include GST. For quotes and orders:
www.scientrific.com.au

FAX ONLY ORDER LINE
1800 171 805
sales@scientrific.com.au

Vernier Accelerometers

Attach a Low-g Accelerometer to the arm, wrist, leg etc. to measure body acceleration during the action of hitting or kicking.
Use a 25g accelerometer to find the acceleration at the point of impact on the striking object i.e. attach to the REAR of the bat or to the foot.

Accelerometers:
ACC-BTA 25g
LGA-BTA Low-g
3D-BTA 3 axis



Hit on a baseball bat's Sweet Spot

PHYSIOLOGY AND SPORTS EXPERIMENTS:
- Relating physiological functions with physical activity
- Investigating stepping forces
- Size of forces in interactions between objects eg a bat and ball
- Study the dynamics of jumping and walking
- Neuromuscular reflexes

Vernier Hand Dynamometer

Used to measure grip strength or finger-pinch strength.

The Hand Dynamometer can be used alone or in combination with the EKG-BTA for detailed studies of muscular activity.
HD-BTA

PHYSIOLOGY AND SPORTS:
- Relating physiological functions with physical activity
- Grip strength and muscle fatigue
- EMG and muscle strength
- Heart rate and physical fitness

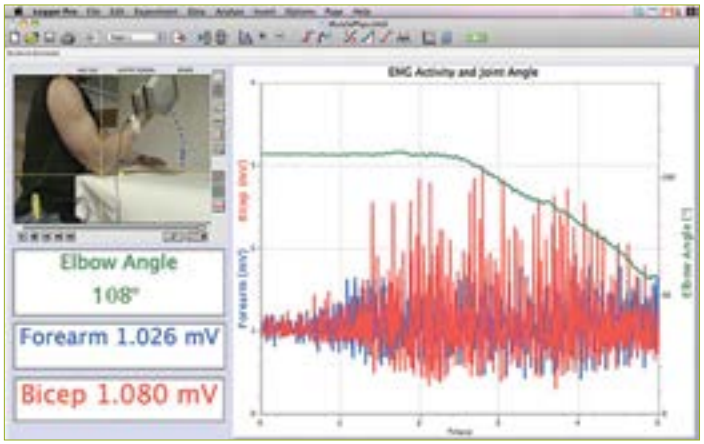
Capture - Analyse - Share
Vernier Video Analysis
Sample experiment with an EKG, LGA-BTA, LabQuest Mini & Logger Pro

An EKG sensor is connected to a LabQuest Mini, EKG sensors are attached to the bicep and forearm muscles to record muscle activity. A Low-g Accelerometer attached to the wrist measures joint angle.

The video capture feature in Logger Pro is used to synchronise video from a DV camera and the data from the LabQuest Mini as the subject performs a simple bicep curl.

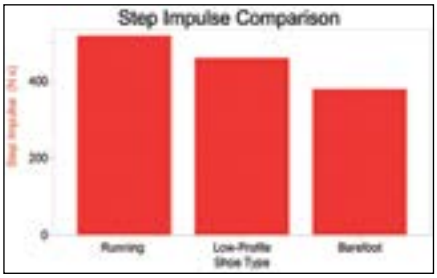
Students can clearly see that muscle activity precedes movement of the arm and that the forearm muscle activity precedes activation of the bicep.

Using Logger Pro's data share the data can be shared wirelessly to portable devices like iPads and phones.



Vernier Force Plate

The Force Plate is tough enough to jump on. Investigate interactions between objects like a ball dropping on the Force Plate. Measure forces eg: jumping, leaping, walking, running, kicking, pushing. Ranges: 800N, 3500N.
FP-BTA



PHYSIOLOGY AND SPORTS:
- Relating physiological functions with physical activity
- Investigating stepping forces
- Size of forces in interactions between objects eg a bat and ball
- Study the dynamics of jumping and walking

Vernier Wireless Dynamics Sensor System

The Bluetooth enabled Wireless Dynamics Sensor System combines a 3-axis accelerometer, altimeter and a force sensor that can store data and instantly or at a later time send it wirelessly to a computer.

Endless sports uses eg acceleration and speed data in a rowing scull, a LabQuest 2 could also be used which would additionally provide GPS data.
WDSS

PHYSIOLOGY AND SPORT:
- Body acceleration when moving
- Rowing dynamics
- Cycling dynamics
- Roller coaster accelerations
- Skateboarding
- Athletics running
- Athletics wheel chair racing

NODE

NODE is a wireless sensor platform that includes a 3-axis accelerometer, gyroscope and magnetometer. Optional sensors include: temperature, light and relative humidity.

Apps allow for data to be collected and analysed on iOS and Android devices.
NODE-IA for iOS and Android
NODE-IOS for iOS only

PHYSIOLOGY AND SPORTS:
- Physiological changes due to roller coaster accelerations, exercise etc (requires other sensors)
- Skateboarding
- Monitor acceleration of limbs during effort events
- Measuring gyroscopic motion and torso angles during rotational actions in sports or movements

Use with a Vernier LabQuest, LabQuest 2, LabQuest Mini, Go!Link, SensorDAQ, EasyLink or LabPro.

Due to the volatility of the Australian dollar we have not printed prices however all prices can be found on our website.

Feb 2015

Scientrific®

Vernier International

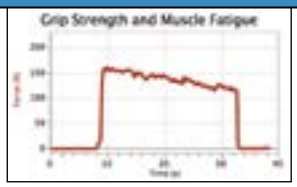
Data Technology Collection and Analysis

Sensor Connectivity Technologies

- Plug and play cable connection to LabQuest
- Remote data collection or Bluetooth (WDSS)
- In-built sensors (LabQuest: accelerometers and GPS)
- Go! Wireless direct to iPhones, iPads, Androids and LabQuest 2

... Choose a sensor, connect to a data logger and go!

LabQuest 2 Data Logger



Logger Pro Data Analysis

Biomechanics - Forces
Dual Range Force

DFS-BTA

Biomechanics - Motion
Low-g Accelerometer

LGA-BTA, 0650-15

Ground Pressure
Force Plate

FP-BTA

Cadence
Goniometer

GNM-BTA

Rowing - boat dynamics
Wireless Dynamics Sensor

WDSS or LabQuest 2

Shot Put - arm action
NODE

NODE

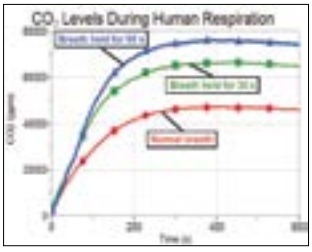
Ball Strike - hitting zone
Accelerometers

ACC-BTA

Vertical Leap - Reaction
Force Plate

FP-BTA

Physiology – Respiration
Carbon Dioxide Sensor



CO2-BTA

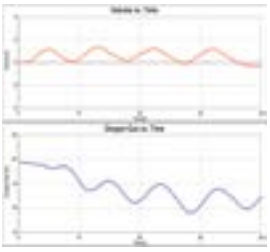
Heart Function
EKG (and Goniometer)

EKG-BTA

Heart Pump Model
Heart Anatomical Model

0651-00 **BM607002**

Aerobic Metabolism
Spirometer with Oxygen Sensor



O2-BTA, O2-SPR, SPR-BTA

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