



Datalogging with Handheld Technology

KS3 Science
Unit 9B
Fit and healthy
Exercise and heart rate.

This year 9 unit provides opportunities for the use of an exercise heart rate monitor in the exploration of 'fitness' as detailed in the following extract from the QCA specification. The sensor, incorporating a POLAR chest belt, enables continuous monitoring of heart rate before, during and after exercise.

What do we mean by fit?			
<i>Learning Objectives</i>	<i>Possible Teaching Activities</i>	<i>Learning Outcomes Pupils</i>	<i>Points To Note</i>
<ul style="list-style-type: none"> ◆ to relate fitness to the systems of the human body ◆ that 'fitness' is different for different individuals 	<p style="text-align: center;">****</p> <ul style="list-style-type: none"> ◆ Ask pupils to carry out simple activities to measure aspects of fitness, eg <i>running on the spot, or steps, for 30 seconds and monitoring the return of pulse and breathing rates to resting level using datalogging equipment; fat callipers on upper arm; pressing a set of bathroom scales with arms raised to measure muscle strength.</i> 	<ul style="list-style-type: none"> ◆ identify aspects of fitness and describe how fitness might differ in different individuals ◆ describe ways in which fitness relates to some of the body systems 	<ul style="list-style-type: none"> ◆ Teachers will be aware of the need to be sensitive to the circumstances of individual pupils and their families, and the need to encourage pupils to be sensitive to differences between them. <p style="text-align: center;">****</p>

A further opportunity for datalogging in this unit:

- ◆ The effect of caffeine on reaction time.

Safety

the needs of pupils with specific medical conditions, and those excused from PE, should be considered when deciding if they should take part. Suitable shoes should be worn, and benches/steps should be held firm. Over-competitiveness should be avoided

Datalogging kit

- ◆ TI-73, TI-82, TI-83 or TI-83plus graphing calculator.
- ◆ CBL or CBL2.
- ◆ exercise heart rate monitor.
- ◆ TI-GRAPH LINK™ software and cable to link to computer.
- ◆ chembio application (TI-83 plus) or program group (TI-73, TI-82 and TI-83).
- ◆ TI InterActive!™ or spreadsheet application.

Apparatus required

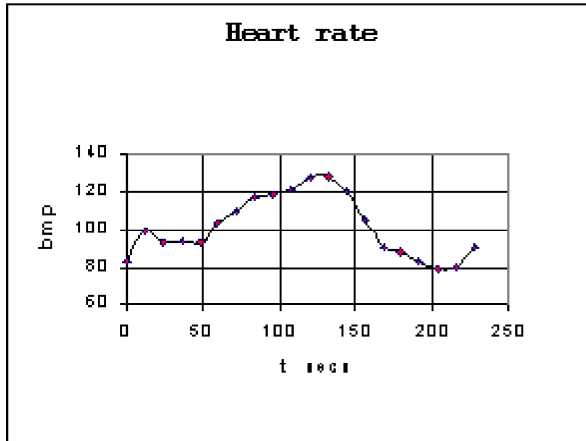
- ◆ simple exercise equipment such as bench, bicycle or steps.
- ◆ 5% NaCl solution for good contact between the chest belt electrodes and the chest.

Useful web sites

www.ti.com/calc/docs/graph.htm
www.vernier.com
www.oxford-educational.co.uk
www.qca.org.uk

Activity

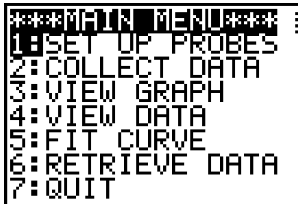
Heart rate before, during and after exercise.



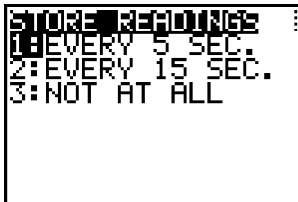
In this example, the heart rate data list has been converted into a .txt file using TI-GRAPH LINK™, opened in a spreadsheet application and used to generate the graph.

Technique.

1. Wet each electrode on the POLAR transmitter belt with the 5% NaCl solution, position on the subject just below the chest, and hold it in place with the elastic strap.
2. Fit the receiver module into channel 1 on the CBL/CBL2.
3. Attach the calculator to the CBL/CBL2.
4. Open the chembio application/program and press enter to get to the following screen:-



5. Select SET UP PROBES and follow the on screen prompts to place the heart rate monitor in channel 1.
6. On the SELECT DEVICE menu, select 2: CHEST BELT.
7. On the HEART RATE MENU select 1: COLLECT DATA to get to the following screen:-

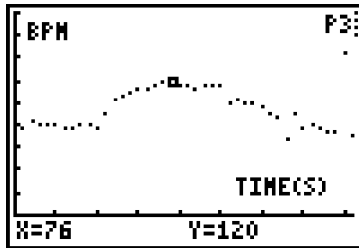


8. Select either 1: EVERY 5 SEC. or 2: EVERY 15 SEC. and sampling begins.

RATE = 99 BPM
PRESS [ENTER]
TO STOP

*The calculator now displays this screen, with the BPM value being continuously updated.
No real time graph is available.*

9. At the end of the sampling period, press enter, and on the HEART RATE MENU select 3: VIEW BPM GRAPH.



*The < and > arrow keys can be used to trace the graph with the corresponding values for x and y being displayed.
The recovery period can thus be investigated on screen.*

NB. This is the relationship between sampling modes and data points.

STORE READINGS	STORE READINGS
1: EVERY 5 SEC.	2: EVERY 15 SEC.
4 seconds between data points on graph	12 seconds between data points on graph

10. Press enter, 4: RETURN and 7: QUIT to finish.

Possible Extension Work.

- the effect of intensity of exercise on heart rate.
- the effect of length of exercise on heart rate.
- the effect of caffeine on heart rate.

Links.

- many conceptual links with unit 8A Food and digestion, and Unit 8B Respiration.
- an important foundation for work at *key stage 4*.