

## To investigate the relationship between depth and pressure in a liquid

Have you ever noticed how the water feels 'heavier' the further down you go?

That is because there is pressure at the bottom of a liquid due to its weight. The more liquid there is above you, the heavier it is, and the greater the pressure.

In this experiment you will investigate the relationship between the pressure in a column of water and its depth.

A graduated cylinder is filled with water. The pressure is taken at different depths within the cylinder, and a graph of depth vs. pressure is drawn.

### Apparatus



Graphing calculator
CBL
Large cylinder
Thistle funnel

### Procedure

Attach the pressure sensor to the thistle funnel using a piece of plastic tubing. Ensure that all the connections are airtight.

Turn on the CBL and calculator. Select the **DATAMATE** programme from the **APPS** menu. Press **CLEAR** to reset the programme. Press **ENTER** at the welcome screen. The CBL will check for probes. Screen 1 will be shown.

```
CH 1:PRESS(KPA)      99.3

MODE:TIME GRAPH - 100

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1:SETUP      4:ANALYZE
2:START      5:TOOLS
3:GRAPH      6:QUIT
```

Screen 1

Select **1:SETUP** and press the up arrow  $\uparrow$  to highlight **MODE**.

Press **ENTER** to get screen 2

```
SELECT MODE

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1:LOG DATA
2:TIME GRAPH
3:EVENTS WITH ENTRY
4:SINGLE POINT
5:SELECTED EVENTS
6:RETURN TO SETUP SCREEN
```

Screen 2

Select **3:EVENTS WITH ENTRY**

At the next screen select **1: OK** to get screen 3

```
CH 1: GAS PRESSURE(M03.6

MODE:EVENTS WITH ENTRY

-----
1:SETUP      4:ANALYZE
2:START      5:TOOLS
3:GRAPH      6:QUIT
```

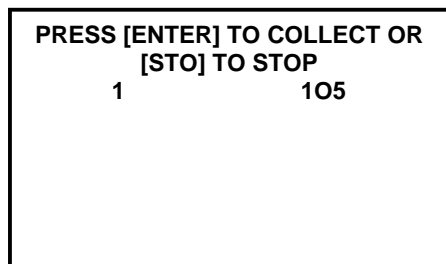
Screen 3

## To investigate the relationship between depth and pressure in a liquid

### To collect Data

Place the top of the thistle funnel just over the top of the water in the cylinder

Select **2:START** to collect data. Screen 4 will appear.



Screen 4

When the pressure reading on the calculator stabilizes, press **[ENTER]**. The calculator will prompt you to enter a value. Type in "0" as the value. Press **[ENTER]** to store this data pair.

Move the thistle funnel down 5 cm and repeat the procedure entering "5" as the value. Repeat collection increasing the depth by 5 cm<sup>3</sup> up to 50cm. Once the last data pair has been collected, Press **[STO▶]** to stop.

### Processing the data

The calculator will produce a graph of pressure vs. depth.

Print out this graph and answer the following questions :

1. What is the relationship between depth and pressure in a liquid?
2. If you tried this experiment with a liquid that was less dense than water, do you think the slope of the line would be greater or less than the one obtained in this experiment?
3. Explain your answer to question 2)
4. Use your graph to work out a value for atmospheric pressure.

Try repeating this experiment using different liquids.

Is the relationship the same for all liquids?  
If not, why not.