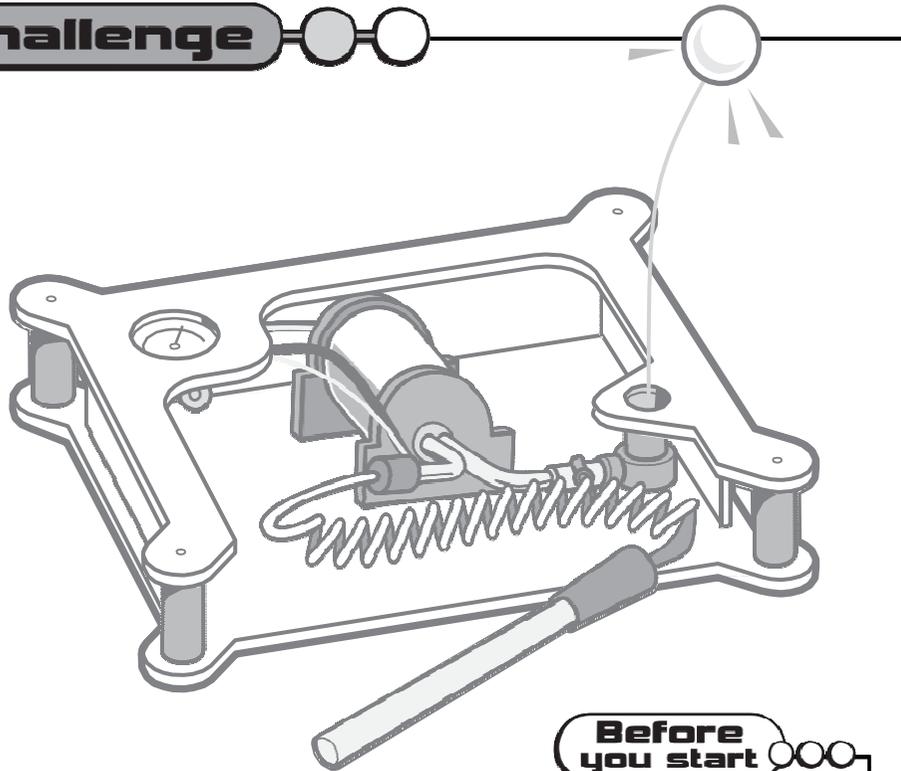


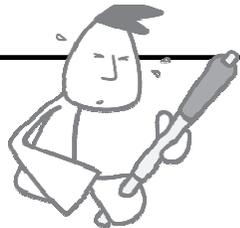
# UNDER PRESSURE

## Challenge



### Before you start

Use your energy to launch the ball!



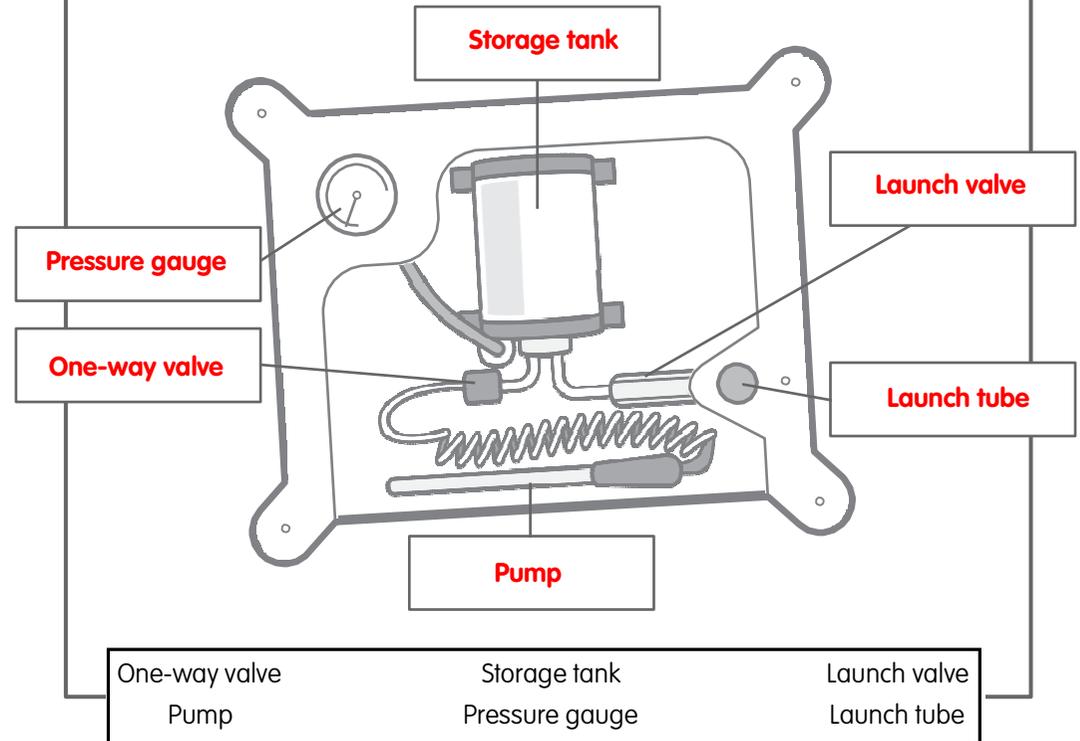
### Think about.

How high did it go?  
How much pressure did you create?

# UNDER PRESSURE

Pump the hand pump until the dial on the gauge reaches a pressure of 1.0 bar. Put the ping pong ball in the clear plastic tube. Open the launch valve and watch what happens.

1. Fill in the boxes on the diagram to name the different parts of the exhibit.

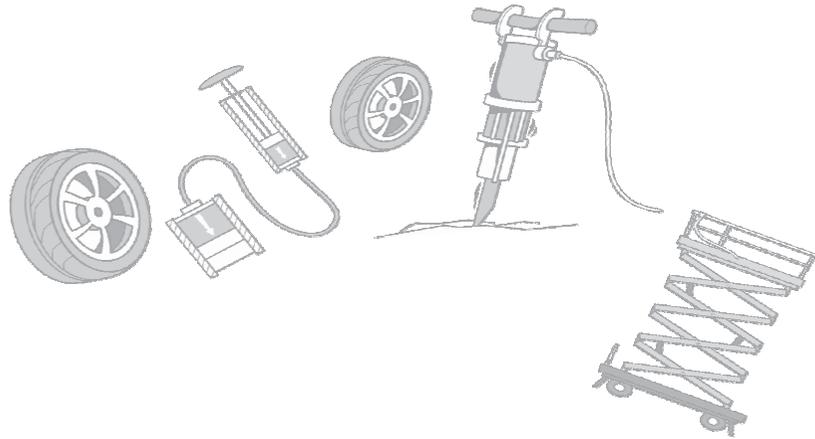


2. Can you think of examples of how we use high pressure gas or liquid?

**Hydraulic jacks; hydraulic suspension in some cars; tyres; balloons, gas storage canisters and aerosols**

*See pictures on next page for help*

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3. What is happening as you use the exhibit?  
Put the following statements in order in the boxes below

- A. Air travels down the launch tube and exerts a force on the ping pong ball.
- B. The one-way valve prevents it escaping.
- C. Opening the launch valve releases the pressure
- D. The ping pong ball is pushed into the air.
- E. The pump forces air into the storage tank.
- F. As more air is pumped in it becomes compressed and pressure builds up.



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**Experiment:** Will changing the pressure effect the height of the ball?

4. Put the exhibit on the floor next to a vertical metre rule or measuring tape. Measure the height of the ball at 3 different pressures. Repeat each one 3 times.

Pressure (bar)	Height (m)	Height (m)	Height (m)	Average (m)
0.5				
1.0				
1.5				

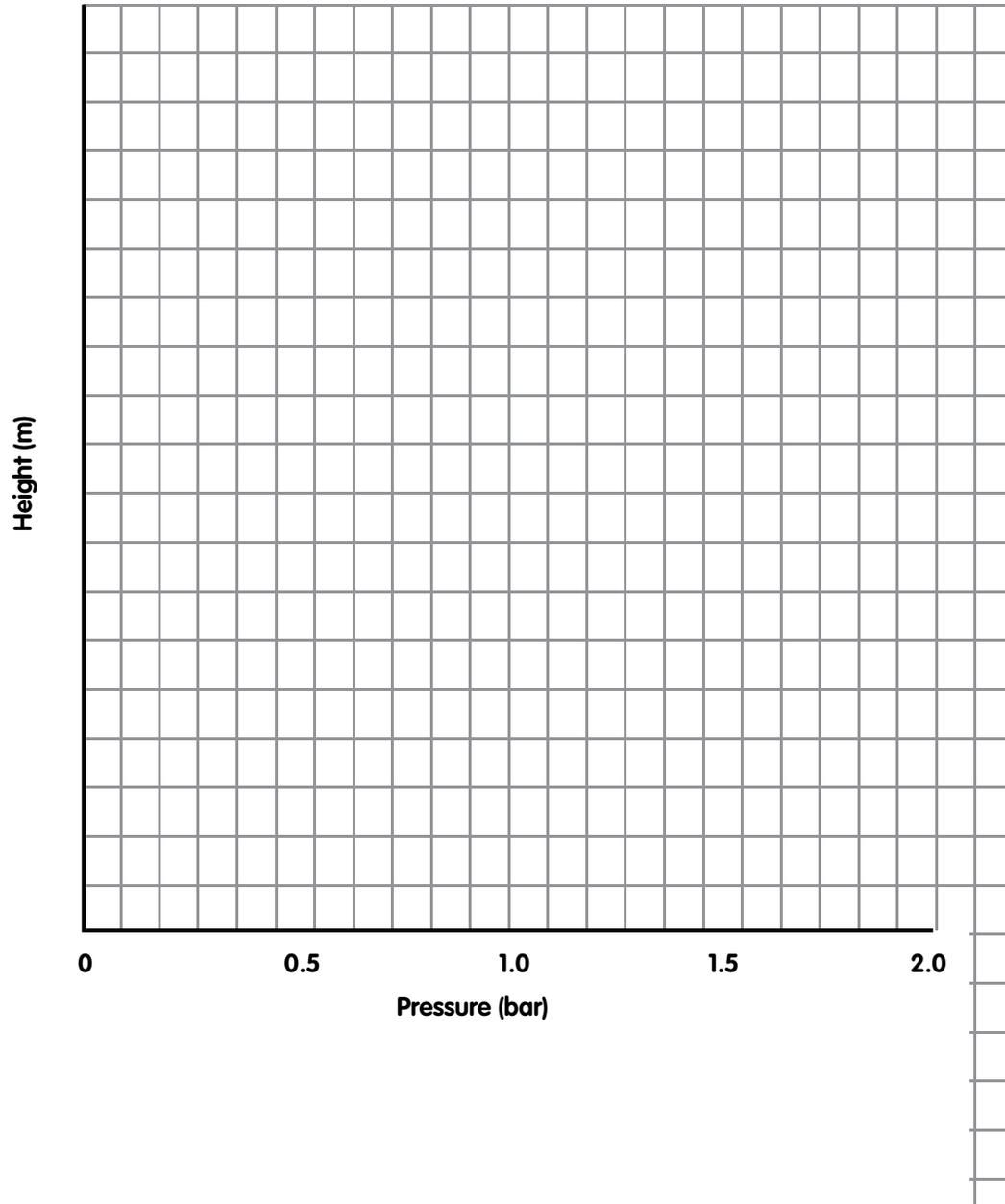
**Results should show that as pressure increases the average height also increases. They will probably show some variation, as height of the ball can be difficult to measure.**

5. Why is it important to repeat each reading at least 3 times?

**It is possible to calculate an average, which will provide a more accurate result. One reading may not match the rest of the data / may be an anomaly. Taking several reduces the effect of variation in the results.**

# UNDER PRESSURE

6. Draw a line graph to show your results



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7. What did you find out? Write down your conclusions

A. **As the pressure increases, the height that the ball reaches increases.**

B. **Any other reasonable observations consistent with the data**

C



# UNDER PRESSURE

## 8. Pressure is a force applied over a particular area.

The force of the compressed air has raised the ball off the ground – increasing its gravitational potential energy (GPE)

### Calculate the change in gravitational potential energy of the ball

using the information provided and the data you collected for a pressure of 1bar.

**GPE gained = m x g x h**, where:

GPE = gravitational potential energy in joules (J)

m = mass in kilogrammes (kg)

g = gravitational field strength (**10 m/s<sup>2</sup>**)

h = height in metres (m)

Mass of ball = 5g

$$\text{GPE} = m \times g \times h$$

$$\text{GPE} = \mathbf{0.005 \times 10 \times \text{height in metres}}$$

$$\text{GPE} = \quad \quad \text{J}$$

Notes:

**This space can be used for doing calculations, as required**

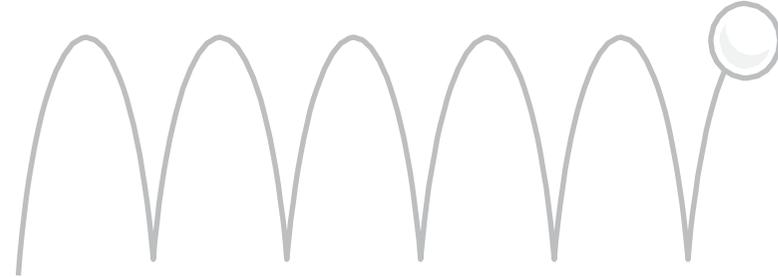
# UNDER PRESSURE

## 9. Energy transfers

When an object falls its GPE is transferred into kinetic energy and other forms of energy, such as heat and sound.

The diagram below is incorrect.

Redraw it correctly in the space provided and explain why yours is different.



**Diagram as above, but showing that each bounce is slightly lower than the previous one, gradually diminishing to nothing.**