INTRODUCTORY PHYSICS

Making first impressions count

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Can you remember the first time you entered a physics laboratory? Was it exciting, perplexing or stimulating? I recall my first physics teacher's voice, sounding as if he should be singing in a male voice choir, declaiming Newton's laws of motion – mysterious!

Most of that mystery is gone for senior school pupils. They have already been taught physical science in their junior schools and have lost the interest engendered by the introduction of a new subject. All teachers now have to work harder to engage with pupils. It is difficult to compete with the instant stimulus provided by television and computer games.

One way to get around this problem is to set up a 'Physics challenge', as described below, on induction day. This one-off introductory lesson is well worth offering, as it can give incoming pupils a positive attitude towards physics before they start senior school. Also, year 10 or 11 helpers can gain from taking part, and perhaps will even be encouraged to become the physics teachers of the future. Such an event increases the profile of physics within the school, and parents are reassured that it has an active and lively physics department – an essential requisite of a good school.

Divide the class into four groups of 4–6 pupils, each with its own year 10 or 11 helper. The four tasks are set up on separate benches in the lab and the groups move from one to the next, allowing about 10 min per task. The helpers must be briefed beforehand. I have found that it works well to ask them to give assistance with parts (a) and (b) of each task if necessary, but to leave the group to complete the last part of each task without any help. If time allows, a simple quiz can be added. Answers are written down on the worksheets, either by the helper or a team member. Allow about 5 min for the helpers to mark their teams' efforts as you give out the answers. Giving certificates to the winning teams and a small memento to everyone, such as a pencil inscribed with the name of the school and 'Physics challenge', seems to be appreciated.

This set-up is only intended to be used as a starting point; individual teachers may want to modify it to suit the needs of their own school's pupil intake.

Corrie Lowry *Birkenhead High School*

Task 1: Floating and sinking

(a) Can you model a piece of plasticine into a shape that floats?
Draw the shape below.

(b) Can you make a piece of aluminium foil sink?
What did you have to do to make it sink?

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(c) Pine is a soft wood, the density of which is lower than the density of water. A solid cube of pine wood will float.
Is it possible to make an object of any shape out of pine **only** that will sink?
Explain your answer carefully.

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Task 2: Lamps in series and parallel

Set up the following circuits.

(a) Series circuits

S_1 and S_2 are switches in the diagram below. Complete table 1 for this series circuit.

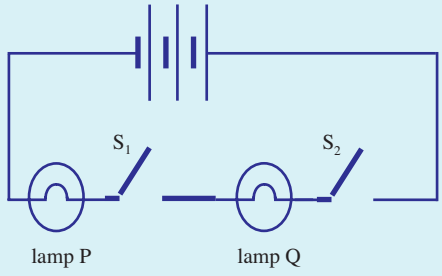


Table 1. Series circuits

switches		lamps	
S_1	S_2	P	Q
open	open	off	off
open	closed		
closed	open		
closed	closed		

(b) Parallel circuits

Complete table 2 for the parallel circuit below.

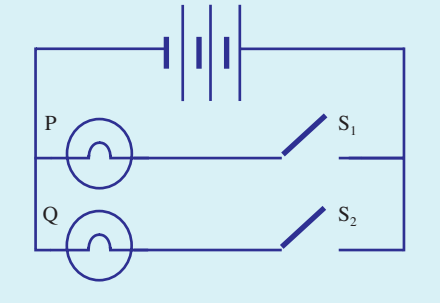
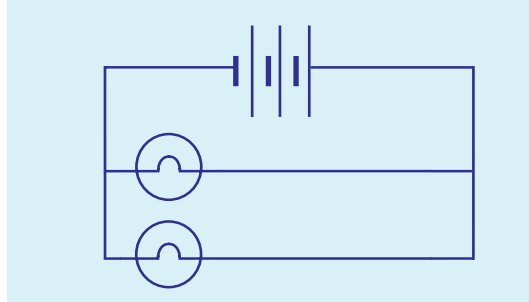


Table 2. Parallel circuits

switches		lamps	
S_1	S_2	P	Q
open	open	off	off
open	closed		
closed	open		
closed	closed		

(c) Can you add **one** switch to the circuit below that will switch off both lamps together? Write S on the diagram at the point where you would add the switch.



Task 3: Measuring and estimating

(a) With the help of the electric balance can you estimate the mass in grams of one of the marbles in the plastic bag?
Show how you get your answer, writing down any assumptions that you have to make.

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(b) Can you estimate the number of marbles in the container without taking them out to count? You are provided with an identical empty container. Show how you work out your answer.

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(c) Estimate the thickness of one page of the textbook. Show how you work this out.

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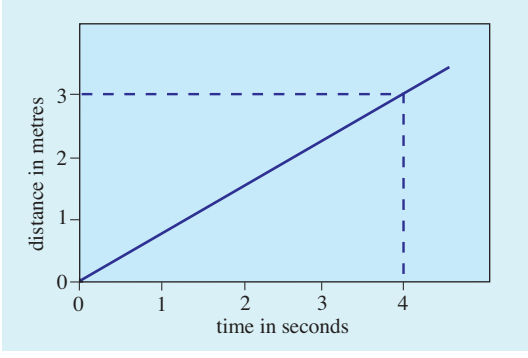
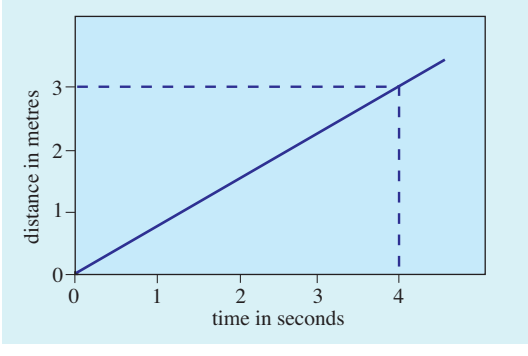
Task 4: Using the motion sensor

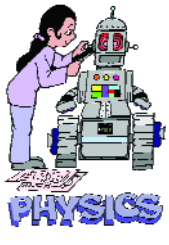
The motion sensor linked to the computer produces a graph that shows how far away you are from the sensor as time goes on. The graph below shows that 4 s after starting, the person was 3 m from the sensor.



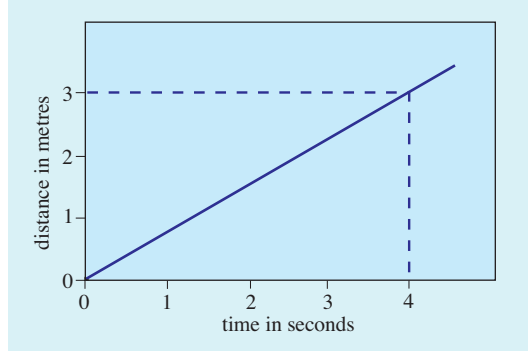
(a) Stand in front of the sensor and walk slowly away from it at a steady pace.
Draw the graph that appears on the screen on the axes below and label it 'slow'.



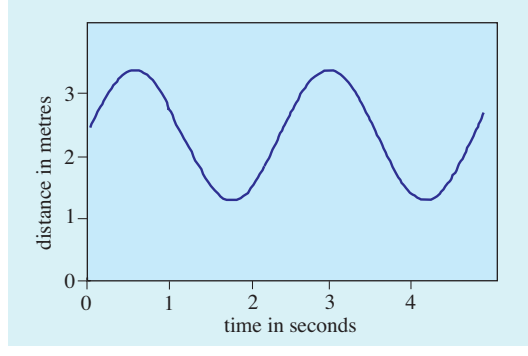
(b) Stand in front of the sensor and walk quickly.
Add the graph that appears to the axes above and label it 'fast'.



(c) Stand 2 m away from the sensor and then walk slowly towards it.
Draw the graph that appears on screen on the axes below.



(d) Can you make a graph like this appear on the screen? What did you have to do?



(e) How do you make a straight horizontal line appear on the screen?