

Glenalmond College



SCHOLARSHIP EXAMINATION

PHYSICS

2007

Time: 30 minutes

Name:

School:

Question 1

Amy fixes the top of a spring to a hook. She attaches various masses to the other end. She measures the length of the spring before she starts and then again every time she adds a new mass to the end of the spring. Below is her table of results with some columns still to complete.

Load (g)	Load (kg)	Load (N)	Length (cm)	Extension of spring (cm)
0			10.0	
200			12.4	
400			14.8	
600			17.2	
400			14.8	
0			10.0	
600			17.2	
800			20.4	
1000			26.0	
400			19.0	

A] Complete the columns in the table above. You will need to use the equation:

$$\text{Load in Newtons} = \text{Load in kgs} \times 10 \text{ N/kg}$$

To complete the third column.

B] Plot a graph of Load (N) on the y-axis and extension (cm) on the x-axis on the graph paper provided. You should use the extension when the length was 14.8cm for a load of 400g when you plot your graph. Draw in a line or curve of best fit.

C] Use your graph to answer the following questions (in each case show clearly how you have used your graph to answer the question):

(a) What was the length of the spring when the load was 300g?

(b) What was the load when the length of the spring was 18cm?

D] The first time there was a mass of 400g hung on the spring the length of the spring was 14.8cm. The second time it was also 14.8cm. Why do you think the length was different the third time 400g was hung on the end of the spring?

Question 2

Callum has been learning about **static electricity**. He has done experiments with charged rods and he knows that **like charges repel** and **unlike charges attract**. He also knows that a **charged and an uncharged rod will also attract**.

His teacher has given him the following question to answer for prep:

6 conducting balls are hung from insulating threads. Ball 1 has been given a positive charge.

One after the other, different balls are brought near to each other and the following observations are made:

- (i) When ball 2 is brought near ball 1 they repel each other.
- (ii) When ball 3 is brought near ball 2 they repel each other.
- (iii) When ball 3 is brought near ball 4 they attract each other.
- (iv) When ball 4 is brought near ball 5 they repel each other.
- (v) When ball 6 is brought near ball 3 they attract each other.
- (vi) When ball 6 is brought near ball 4 they attract each other.

Use this information to decide whether each ball is positively charged, negatively charged or uncharged. You should give a reason for each answer that you give.

Ball 2.....

.....

Ball 3.....

.....

Ball 4.....

.....

Ball 5.....

.....

Ball 6.....

.....

Fill in the answers that you think Callum should have given.

Question 3

Stephen has been driving his Physics teacher 'up the wall'. They have been learning about **Density** by doing experiments to find the mass and volume of different objects and then they have been using the equation:

$$\text{Density (g/cm}^3\text{)} = \frac{\text{mass (g)}}{\text{Volume(cm}^3\text{)}}$$

to calculate the density of the materials that the objects were made out of.

Stephen has been asking more and more questions about how to find the volume of different shapes and sizes of objects but he hasn't finished all the experiments that he was supposed to do. His teacher decides to give him an extra question to answer for prep that night. Here it is:

Using anything that you have at home how would you find your own density?

Stephen knew how to find his mass – that was easy - he could just stand on the bathroom scales to do that but he had to think a bit harder about how to find his own volume until he remembered a story he had heard about Archimedes.

What would you do to find your own volume using anything that you have at home? Write your answer in the space below. You might find that drawing a diagram will help you to explain what you would do.