Glenalmond College | inspiring learning

# SCHOLARSHIP EXAMINATION

## PHYSICS

**2014**

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Time: 30 minutes

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**Name:** …….

**School:** …….

***Candidates will need a pen, pencil, ruler and a sheet of graph paper***

***A calculator and protractor can be used for this paper***

The Sochi winter Olympics took place at the beginning of February 2014. Most of the following questions are based on the Physics behind these games.

1. Each of a pair of downhill racing skis is 12 cm wide and 1.80 m long. The weight of the racer, her clothing and the skis is 750N

a) Write down the equation linking Force, Pressure and Area. (1)

_____

b) Calculate the pressure exerted on the level snow above the start gate when the skier is standing motionless on both skis.

_____

_____

_____

_____answer_____unit_____ (4)

The winner will be the racer who completes the course in the fastest time.

c) What type of useful energy does the skier have at the start? _____ (1)

To win they need to maximise the efficient conversion of this energy into kinetic energy

d) Name 2 forces which reduce the efficiency of this transfer.

1_____ 2_____ (2)

e) What can the racers do to minimise the effect of your 2 named forces? (2)

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2. The Jamaican bobsleigh team made a welcome return to the event this year but missed their first day of practice because the airline had mislaid some of their baggage which contained the runners for the sled. They had a spare set of runners but did not have the titanium nuts and bolts required to fix them to the bobsleigh. A local firm had 20 nuts and bolts of the correct size to fix the runners but did not know from which metal they were made.

The race engineer arranged to borrow some equipment from a local school so that he could measure the density of the nuts and bolts provided.

a) What did he need to borrow? (2)

_____

_____

b) Write down the equation which links the mass, density and volume of the bolts. (1)

_____

c) Produce a list of instructions that they needed to follow to measure the required data and calculate the results. (3)

_____

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d) Give two checks that they need to make to ensure that the data was accurate. (2)

1_____

2_____

e) What did they need to do to ensure that the data was reliable? (2)

_____

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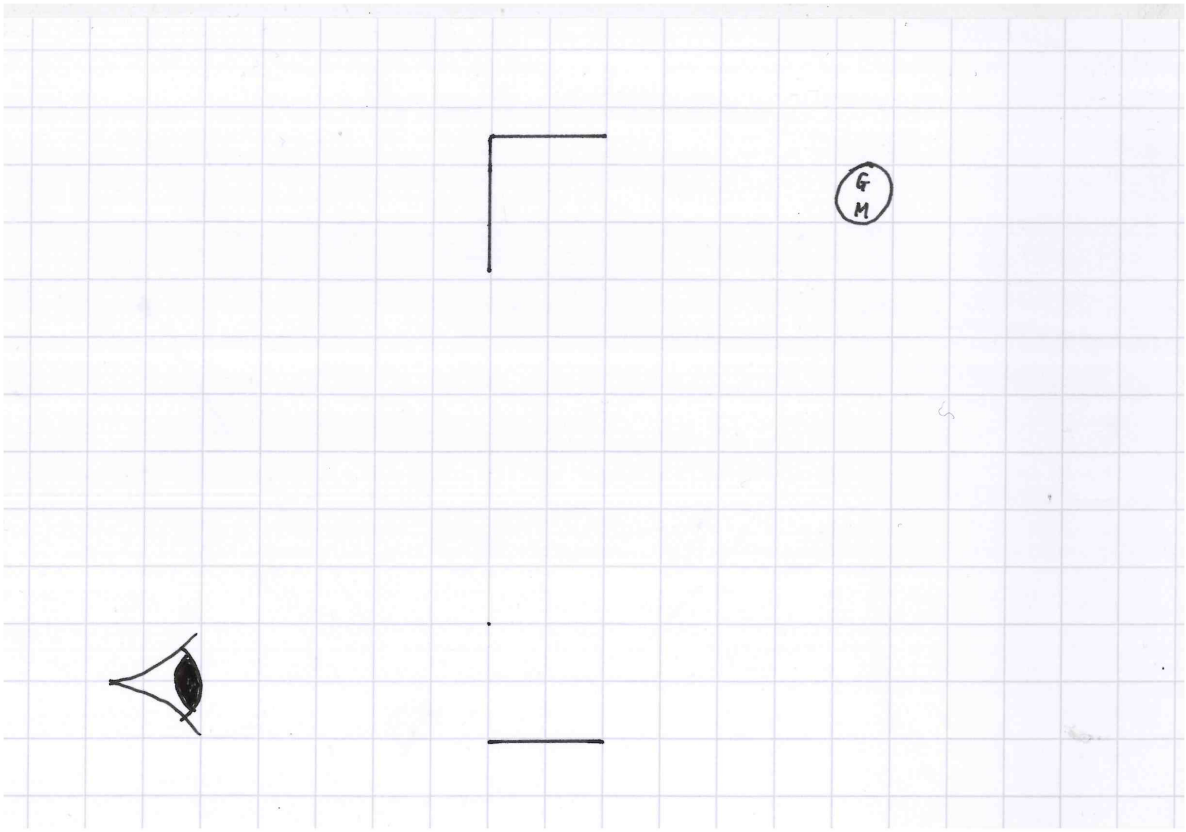
3. A periscope can be used to see over the top of a group of spectators in order to see a medal ceremony. This usually consists of a long cardboard tube with appropriate holes to allow the viewing.

a) Complete the diagram of the periscope, which has been started below, showing the position and orientation of the two mirrors and labelling any of the angles that you know. (3)




Show clearly the path followed by the light rays from the G and M on the medal into the eye. (3)