

# Sample Progressive Test - Mechanics+ Uncertainties in Measurement

## PHYS 1002 PHYSICS 1 (FUNDAMENTALS)

Time Allowed: 50 minutes  
 Marks for questions are as indicated  
 Total: 30 Marks

The test is closed book but you will be supplied with the formula sheet as on back cover of lab notes and a copy of Section 1.5 Experimental Analysis

<b>Name</b>	<b>SID</b>
<b>Lab Session</b>	<b>Date</b>

**Instructions**

All questions are to be answered.  
 All answers should include explanations in terms of physical principles.

**Data**

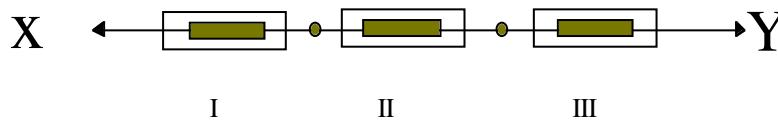
- Density of fresh water at 20° C and 1 atm     $\rho$     =     $1.00 \times 10^3 \text{ kg.m}^{-3}$
- Density of mercury at 20° C and 1 atm     $\rho_m$     =     $13.6 \times 10^3 \text{ kg.m}^{-3}$
- Free fall acceleration at the earth's surface     $g$     =     $9.8 \text{ m.s}^{-2}$

**Part 1 (10 marks)**

Part 1 of the actual test paper will be consist of a number of multiple choice questions, for example

(A)

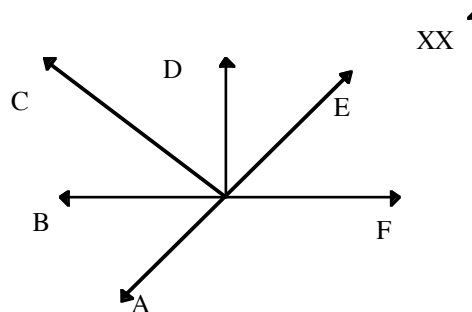
Three springs scales are hooked together as shown below. The scales are at rest on a horizontal and frictionless surface. Someone pulls at points X and Y but the whole system does not move. Scale I reads 50 N. The reading on scale II is



- (1) zero    (2) 50 N    (3) 150 N    (4) 100 N    (5) 200 N

(B)

The diagram at the right depicts a hockey puck moving across a horizontal, frictionless surface in the direction of the arrow XX. A constant force **F** shown in the diagram is acting on the puck. For the puck to experience a net force in the direction of the arrow XX, another force must be acting in which of the directions labelled **A**, **B**, **C**, **D**, **E**?

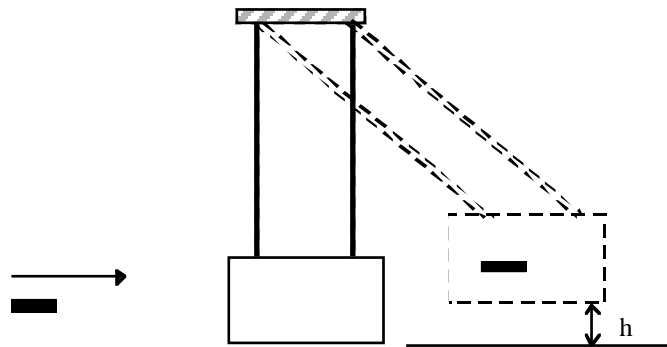


- (1) A    (2) B    (3) C    (4) D    (5) E

## Part 2

### QUES 2

A ballistic pendulum is a device for finding the speed of bullets. A bullet of mass 10 g is shot into a block of mass 5.00 kg. After the collision, the centre of mass of the block swings to a height of 60.0 mm. Find the speed of the bullet.



(10 marks)

### Q3

(a) When conducting an experiment to find the density of an 'Iceberg' a student took one measurement of each of the following:

Mass  $(430 \pm 20)$  g

Volume  $(410 \pm 10)$  mL

What experimental value should be quoted for the density of the 'Iceberg'?

Compare your answer with the density of water which is  $1.00 \times 10^3 \text{ kg. m}^{-3}$ . Show any calculations necessary to justify your answer. (Remember  $10^6 \text{ mL} = 1 \text{ m}^3$ .)

(b) On another day students redid the experiment but the same two measurements of mass and volume were repeated 10 times. The mean values with SEM were found as follows

	Mean value	SEM
Mass (g)	435	10
Volume (mL)	417	5

What experimental value for the density of the iceberg should be quoted in this case?

(c) Are results (a) and (b) consistent? Justify your answer.

(10 marks)