Sample Progressive Test - Language of Physics + Graphing Skills

PHYS 1002 PHYSICS 1 (FUNDAMENTALS)

Time Allowed: 45 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.

Name	**SID**
Lab Session	**Date**

Instructions

All questions are to be answered.

All answers should include explanations in terms of physical principles.

Data

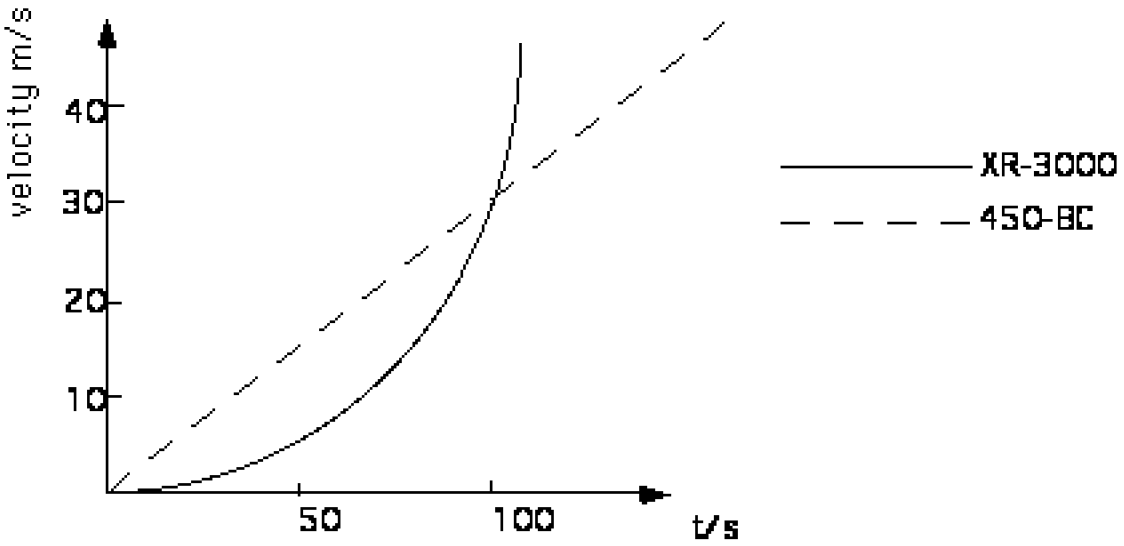
Density of fresh water at 20° C and 1 atm ρ = 1.00×10^3 kg.m^{-3}

Density of mercury at 20° C and 1 atm ρ_m = 13.6×10^3 kg.m^{-3}

Free fall acceleration at the earth's surface g = 9.8 m.s^{-2}

Question 1

The velocity-time graph shown below represents a virtual reality "race" between two different futuristic vehicles code named XR-3000 and 450-BC.



(a) Describe the motion of the two vehicles, using the terminology of physics.

(b) The winning car crosses the line 100 seconds after the start. Which car is it? Explain your answer.

(c) Briefly discuss how realistic you consider the performance of the XR-3000 vehicle.

[5 marks]

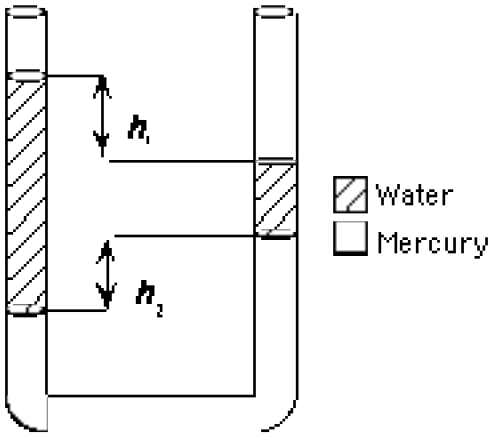
Question 2

If you throw a ball up in the air, it falls back to the ground. Briefly explain in terms of the relevant physics principles how a communications satellite can stay high above the earth's surface, and not fall back to the ground as a ball does. **[5 marks]**

Question 3

(a) Two dams with different capacities are filled to the same depth. Should the strength of the support structure of the dams be the same or different? Explain.

(b) A U-tube of constant cross-sectional area, open to the atmosphere, is partially filled with mercury. Water is then poured into both arms. If the equilibrium configuration of the tube is as shown, with h_2 = 1.00 cm, determine the value of h_1.



[10 marks]

Question 4

The relationship between load (weight) F and extension x of a spring is given by the following equation $F = kx$, where F is in Newtons and x in metres..

A student measured the total length of a spring when various weights were suspended from it, as follows

Weight (N)	0	1.50	3.10	4.40	6.02	7.48
Length (m)	0.21	0.31	0.45	0.54	0.69	0.79

Draw a graph to show the relationship between the weight and extension. Draw in lines of best and worst fit.

What physical quantity does the slope represent?

Determine the spring constant, k , in units of N/m. Include an estimate of uncertainty in your answer.

[10 marks]