AdvReg/sample

PHYSICS 1001/1901
Mid-Semester Test SAMPLE

Surname				**First name**			
SID				**Team no. (e.g. 6REG12)**			
Q1 /4	**Q2 /4**	**Q3 /4**	**Q4 /8**	**Q5 /6**	**Q6 /6**	**Q7 /8**	**Total /40**

Duration **60** minutes + 5 minutes reading time.
CLOSED BOOK test. Calculators may be used but NOT phones, tablets etc.
Answers to be written on the test paper, in the box where provided.
Questions do not all have the same value.
All numerical answers must have appropriate units and significant figures

DATA

Free-fall acceleration at the Earth's surface $g = 9.8\ \mathrm{m.s^{-2}}$

Question 1 **[Total: 4 marks]**

You need about 1 L of paint to cover $10\ \mathrm{m}^2$ of surface. Do a rough calculation of how much paint you'll need to paint one side of a typical door, by first estimating its surface area.

(a) Estimated area A:

(2 marks)

(b) Estimated volume of paint V:

(2 marks)

Question 2 **[Total: 4 marks]**

(a) The weight of a box was recorded as $1200\ \mathrm{N}$. How many significant figures are in this value?

(2 marks)

(b) The dimensions of A4 paper are $2.10 \times 10^2\ \mathrm{mm}$ by $2.97 \times 10^2\ \mathrm{mm}$.

The paper was quoted by the manufacturer to be $8.0 \times 10^1\ \mathrm{g.m}^{-2}$.

What is the mass of a single page of this A4 paper? Express your answer in grams and to the correct number of significant figures.

(2 marks)

Question 3 **[Total: 4 marks]**

(a) Pat, whose weight is 650 ± 35 N, is lying on Bondi beach with 0.3 ± 0.1 m^2 of Pat's body in contact with the beach. How much pressure does Pat exert on the sand? Note that pressure = force/area.

Pressure P:

(1 mark)

Uncertainty in pressure ΔP:

(2 marks)

How should you report this value?

(1 mark)

Question 4 **[Total: 8 marks]**

You want to measure the density of an cylindrical object. You measure the diameter to be 2.54 ± 0.06 cm and the height to be 9.00 ± 0.06 cm. You measure the mass to be 490 g with an estimated uncertainty of 1%.

Hints:

- The volume of a cylinder is given by $V = \pi r^2 h$.
- Density of an object is its mass divided by its volume $\rho = m/V$.

(a) What is the density of the object?

(b) Complete the following intermediate calculations. No need to show working.

Fractional uncertainty in the mass	
Fractional uncertainty in the radius	
Fractional uncertainty in the height	
Fractional uncertainty in the volume	
Fractional uncertainty in the density	
Uncertainty in the density	

(c) State your final result for the density of the object and its uncertainty.

(d) The following shows some densities for different metals. Based on your results, which one(s) could your object be made out of?

Densities:

Metal	Density
Aluminium:	2.70×10^3 kg.m^3
Zinc:	7.14×10^3 kg.m^3
Nickel:	8.91×10^3 kg.m^3
Silver:	10.5×10^3 kg.m^3
Lead:	11.3×10^3 kg.m^3
Gold:	19.3×10^3 kg.m^3

Question 5 **[Total: 5 marks]**

You are cooking eggs in a teflon-coated pan. The coefficient of static friction between teflon and eggs is about 0.04.

(a) Draw a free-body diagram showing all the forces on the egg.

(b) What is the smallest angle from the horizontal that will cause the eggs to slide across the bottom of the pan?

Question 6 **[Total: 5 marks]**

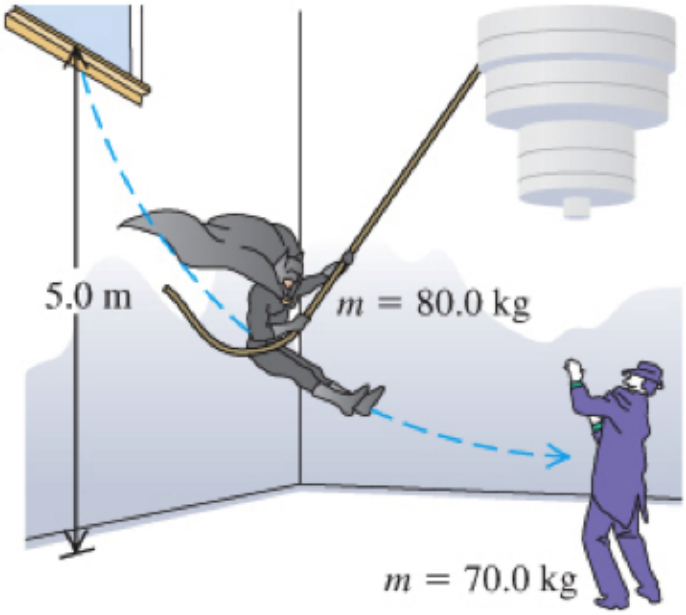
The diagram below depicts two ice hockey pucks which can move across the ice with negligible friction. One puck has a mass four times as great as the other. Starting from rest, the pucks are pushed across the ice by identical forces F.

(a) Which puck will reach the finishing line first? Briefly explain your answer.

(b) It is observed at the finishing line that the more massive puck has greater momentum than the less massive one but that their kinetic energies are equal. Briefly justify why this would be so, in terms of physical principles.

Question 7 **[Total: 10 marks]**

A movie stuntman (mass $80.0\ \mathrm{kg}$) stands on a window ledge $5.0\ \mathrm{m}$ above the floor. Grabbing a rope attached to a chandelier, he swings down to grapple with the movie's villain (mass $70.0\ \mathrm{kg}$), who is standing directly under the chandelier. Assume that the stuntman's centre of mass moves downward by $5.0\ \mathrm{m}$. He releases the rope just as he reaches the villain. Take the value of g as $9.80\ \mathrm{m.s^{-2}}$.



(a) The stuntman grabs and holds onto the villain. With what speed do the entwined foes start to slide across the floor?

(b) If the coefficient of kinetic friction of their bodies with the floor is $\mu_k = 0.205$, how far do they slide?

THERE ARE NO MORE QUESTIONS.