



*Department of Mathematics
and General Sciences*

**General Science (SCI101)
Second Major Exam**

First Semester, Term 131
Date: Wednesday 27/11/2013

Name:	
ID number:	
Section number or time:	
Instructor's name:	

Important instructions:

1. Examination time: 60 minutes.
2. Write your name now before starting with the questions.
3. Switch off your mobile phone and put any books and notes away.
4. You should have 5 pages in total, including this page and a scratch paper.
5. You may use a calculator but you may *not* borrow one.

Good Luck!

Mark

Part 1: 10 multiple choice questions, 1 point each. Circle the letter of the correct answer using a pen. Use $g = 10 \text{ m/s}^2$ and $G = 6.67 \times 10^{-11} \text{ N.m}^2/\text{kg}^2$.

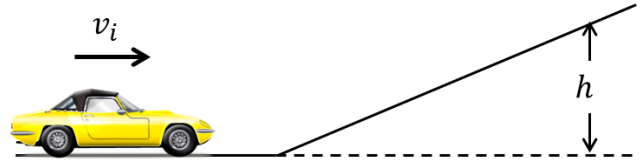
- Q1. Which of the following is **not** a vector quantity?
a) Velocity b) Momentum c) Work d) Impulse
- Q2. In all collisions:
a) Kinetic energy is conserved
b) Momentum is conserved
c) Mechanical energy is conserved
d) All of the above
- Q3. A 5 kg object has a momentum of 17.5 kg.m/s. What is its speed?
a) 3.5 m/s b) 87.5 m/s c) 2.6 m/s d) 7.0 m/s
- Q4. What is the kinetic energy of a 20 kg object having a momentum of 60 kg.m/s?
a) 240 J b) 90 J c) 60 J d) 120 J
- Q5. A 70 kg skater moving at 5 m/s hits a wall and stops in 0.2 seconds. How much force affects him?
a) 2000 N b) 1750 N c) 400 N d) 350 N
- Q6. What is the weight of a 75 kg man on planet Mars, given that the mass of Mars is $6.4 \times 10^{23} \text{ kg}$ and its radius is 3400 km
a) 750 N b) 310 N c) 840 N d) 277 N
- Q7. Ali weighs 800 N on Earth. What is his weight on a planet that has twice the radius of Earth and twice the mass of Earth?
a) 800 N b) 200 N c) 400 N d) 1600 N
- Q8. The efficiency of a machine is 40 %. How much work the machine produces if it is supplied with 150 Joules of energy?
a) 60 J b) 90 J c) 150 J d) 100 J
- Q9. How much power is required to increase the speed of a 1200 kg car from zero to 90 km/h in 5 seconds?
a) 810 kW b) 75 kW c) 972 kW d) 62.5 kW
- Q10. How much work is done in carrying a 10 kg object horizontally at a constant speed of 2 m/s?
a) 100 J b) 200 J c) 300 J d) zero

End of part 1

Part 2: Solve each of the following three problems. **Show your work** in the provided space and include the appropriate units with your answer. Use $g = 10 \text{ m/s}^2$.

- Q1. (3 points) A 1800 kg car stopping at a red traffic light is struck from behind by a 900 kg car moving at 20 m/s. The two cars stick and move together. What is the speed of the joined cars just after the collision?
- Q2. (4 points) A 200 g stone falls from rest from a 10 m high building and reaches the ground. During its fall, air resistance acts on the stone and it does a work of -5 J . Calculate:
- a) The work done by gravity
 - b) The kinetic energy of the stone just before hitting the ground
 - c) Its speed just before hitting the ground
 - d) The average air resistance force (magnitude and direction)

Q3. (3 points) A boy pushes a 0.5 kg toy car on a horizontal floor and it moves at $v_i = 2$ m/s. The toy car encounters an inclined plane, as shown. Assuming no friction:



- a) What are the initial kinetic and potential energies of the car (directly after it was pushed)?
- b) What is the maximum height h the car can reach on the inclined plane?
- c) What are its potential and kinetic energies at that height?

End of part 2

Scratch paper

Name:
