Prince Sultan University

Department of Mathematics & Physics

SCI 101- General Sciences

Second Exam

Second Semester, Term 162

Sunday 30/April/2017

Examination Time : 60 minutes

Name …….

Student I.D. …….

Circle your Section

451	452	453
10 – 10:50	11 – 11:50	1 – 2:15
Dr. Muaffaq Nofal	Dr. Muaffaq Nofal	Dr. Asif Zaidi

Use g = 10 m/s^2

Important Instructions:

1. You can use a scientific calculator that does not have programming or graphing capabilities.

*2. You may **NOT** borrow a **calculator** from anyone.*

*3. Do not use **RED pen**.*

*4. This is a closed books and notes exam. Do **NOT** use notes or textbooks.*

*5. There should be **NO** talking during the examination.*

*6. Your will be **expelled** immediately from the exam if your mobile phone is seen or heard.*

*7. Any signs of **cheating** may cause you being expelled from the exam.*

*8. This examination has **2 parts**. **Part 1** has **8 multiple choice questions**, each question worth **1 point**. **Part 2** has **three workout problems** each problem worth **4 points**.*

Make sure your paper has all the questions and problems.

Part 1: 8 Multiple Choice Questions (1 mark each)

1) A hydraulic jack has a small piston of area 22 cm^2. It is required to obtain a force of 420 N at the large piston when a force of 70 N is exerted at the small piston. What should be the area of the larger piston?

a) 3.7 cm^2

b) 6 cm^2

c) 82 cm^2

d) 132 cm^2

2) The buoyant force acting on an object submerged in a fluid does NOT depend on

a) the density of the object.

b) the volume of the object.

c) the density of the fluid.

d) the acceleration of gravity

3) What is the liquid pressure on a body placed 2.3 km under sea water given that the density of sea water is 1.2 g/cm^3?

a) $1x10^4$ Pa

b) 2.76×10^7 Pa

c) 2.76×10^4 Pa

d) 27.6

4) "The *buoyant force on an immersed body equal the weight of the fluid it displaces*". This is the statement of:

a) Bernoulli's principle

b) Pascal's Principle

c) Archimedes' Principle

d) None

5) The gravitational attractive force between a 4000 kg truck and a 1200 kg car when they are 15 m apart is. ($G= 6.67x10^{-11}$ $N.m^2/kg^2$)

a) $4.1x10^{-6}$ N

b) $2.1x10^{-5}$ N

c) 21333 N

d) $1.4x10^{-6}$ N

6) According to the Newton's law of Universal gravitation if the distance between two masses is increased by 2 times, then the force between them will

a) increase 2 times

b) increase 4 times

c) decrease by 1/4

d) decrease by 1/2

7) Which of the following statements is correct concerning the conservation of energy?

a) If the only force doing work on an object is the force of gravity then the mechanical energy of the object remains constant.

b) If the only force doing work on an object is the force of gravity then the kinetic energy of the object remains constant.

c) If the only force doing work on an object is the force of gravity then the gravitational potential energy of the object remains constant.

d) The mechanical energy of an object always remains constant.

8) If a 12000 kg car can accelerate from rest to 25 m/s in 6 seconds, then the power of its engine is,

a) $2x10^4$ Watt

b) 6.25×10^5 Watt

c) 3.75×10^4 Watt

d) $7.5x10^6$ Watt

Part 2: Solve the following three problems in the space provided in between showing all your steps (4 marks each)

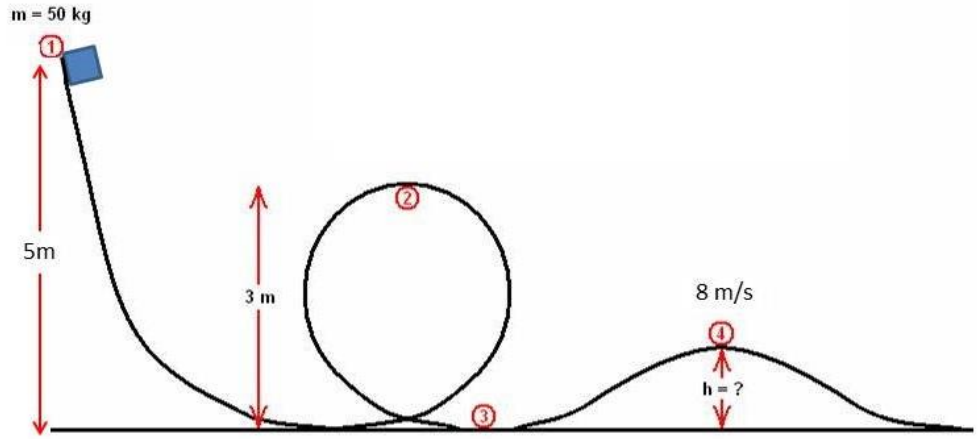
Problem 1: A 10 g bullet travelling horizontally at 400 m/s strikes a sand bag and stops during 0.5 seconds after penetrating 25 cm into it.
(a) What is initial kinetic energy the bullet?

(b) What is the work done on the bullet to stop it?

(c) What is the average force on the bullet by the target?

(d) What is the power of the stopping force of the target?

Problem 2: The shown figure shows a cart of mass 50 kg that starts to slide from rest from a height of 5 m on the shown frictionless track.



a) (2 marks) Calculate the speed of the cart at point 2 where its height is 3m.

b) (2 marks) Calculate the height of the cart at point 4 where its speed is 8 m/s.

Problem 3: A block of wood of volume 4100 cm^3 and density 0.73 g/cm^3 is floating at the surface of a certain liquid such that 1500 cm^3 of its volume lies above the liquid surface. Calculate

a) (1 mark) the mass of the wooden block.

b) (1 mark) the buoyant force on the wooden block.

c) (1 mark) the volume of the liquid displaced.

d) (1 mark) the density of the liquid

Scratch paper