Prince Sultan University
Deanship of Educational Services
Department of Mathematics and General Sciences

COURSE DETAILS:

PHYSICS I	PHY105	FINAL EXAM
Semester:	Fall Semester --Term 181	
Date:	Wednesday, December 26, 2018	
Time Allowed:	180 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	532, 535, 538, 541
Instructor's Name:	Circle the name of your Instructor: Dr. Muaffaq Nofal, Dr. Hazem Abu-Farsakh, Dr. Asif zaidi

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Page 5	Page 6	Page 7	Total
Questions								
Marks	5	5	10	8	4	4	4	40

Part 1: 10 Multiple Choice Questions (1 marks each)

Use: The magnitude of the acceleration of gravity g = 9.8 m/s²

1) A fluid discharge rate is given as $1200 \frac{liter}{minute}$. What is the value of this discharge rate in units of $\frac{m^3}{s}$? given that ($1 \ m^3 = 1000$ liter) and (1 minute = 60 seconds).

a) $72 \frac{m^3}{s}$ b) $20000 \frac{m^3}{s}$ c) $0.02 \frac{m^3}{s}$ d) $7.2 \times 10^7 \frac{m^3}{s}$

2) When an object travels from the point (-5m,14m) to the point (25m,-4m) in 6 seconds, then the directional angle of its average velocity is:

a) 59°   b) 301°   c) 31°   d) 329°

3) A car starts to move from rest along a straight line and accelerates at a rate of 1.6 m/s² for 20 seconds. Then it continues moving with a constant speed for 70 seconds. Find the total distance covered by the car.

a) 2240 m   b) 2560 m   c) 320 m   d) 1920 m

4) In the system shown in the figure the mass m_1 accelerates upward. Which one of the following statements about the tension T in the rope is correct: (Assume that the pulley is frictionless and the rope has negligible mass).

a) $m_1 \, g < T < m_2 \, g$

b) $m_2 \, g < T < m_1 \, g$

c) $T = m_1 \, g$

d) $T = m_2 \, g$
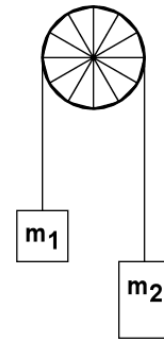
5) A stone is thrown form ground with a speed of 50 m/s at an angle of 60° above horizontal towards a wall that is 40 m away. At what height above the ground will the stone hit the wall?
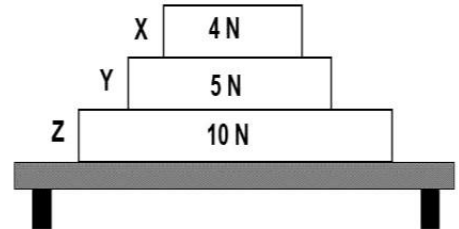
a) 56.7 m   b) 67.3 m   c) 81.2 m   d) 44.4 m

6) A 1200 kg car can accelerate from rest to 90 km/h in 6 seconds. What is the power of this car's engine?

a) 10^4 Watt   b) 3.75×10^5 Watt   c) 6.25×10^4 Watt   d) 9×10^6 Watt

7) Three books X, Y, and Z all rest on a table. The weight of each book is indicated in the figure. The net force acting on book Z is

a) 9 N upward   b) 9 N downward

c) 5 N downward   d) Zero

8) A bomb at rest explodes into two parts of un-equal masses that go in opposite directions. What is the total momentum of the two parts after the explosion?

a) 0   b) 50 kg.m/s   c) -25 kg.m/s   d) There is no enough information.

9) What is the angular acceleration of a rotating disk that slows down from an angular speed of 130 rev/min to 70 rev/min in 4 seconds?

a) -60 rad/s^2 b) -6.28 rad/s^2 c) -15 rad/s^2 d) -1.57 rad/s^2

10) A particle rotates in a circle of radius 80 cm at an angular speed of 9 rad/s. What is the magnitude of its centripetal acceleration?

a) 7.2 m/s^2 b) 51.84 m/s^2 c) 101.25 m/s^2 d) 64.8 m/s^2

Part 2: 9 Multiple Choice Questions (2 marks each)

1) A 0.7 kg ball falls down and hits the floor at a speed of 15 m/s. The ball then bounces back up at a speed of 12 m/s. If the ball was in contact with the floor for 0.06 s, what was the average force from the floor on the ball?

a) 35 N downward   b) 35 N upward   c) 315 N downward   d) 315 N upward

2) A massless spring is hanged vertically from the ceiling. When a 3 kg block is hanged from the lower end of the spring, it is stretched down by 4 cm. What is the spring constant of this spring?
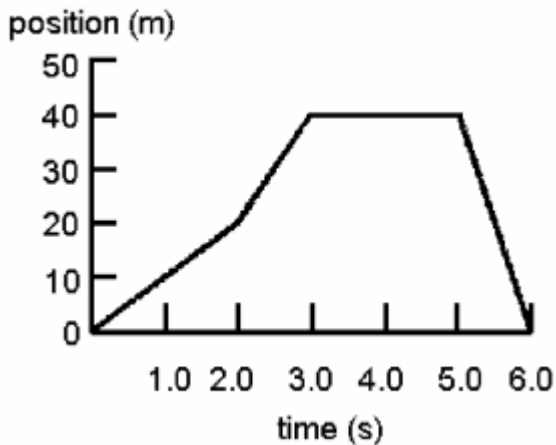
a) 7.35 N/m   b) 735 N/m   c) 75 N/m   d) 0.75 N/m

3) A ball is thrown straight upward with a speed of 36 m/s. How long does it take to return to its starting point?

a) 14.7 s   b) 11 s   c) 7.35 s   d) 3.67 s

4) The shown figure represents the position of a moving object at several times. What is the average speed of the object between t = 1 s and t = 5 s?

a) 8 m/s

b) 7.5 m/s

c) 15 m/s

d) 30 m/s

5) A 2 kg block slides down a frictionless incline ($\theta = 37^o$) while a force F is opposing its motion causing it to move with constant speed for a distance of 5 m. Find the work done by the applied force F.

a) -59 J   b) 59 J   c) -98 J   d) 98 J

6) A 1.5 kg ball tied to a string of length 80 cm is released from rest from position A as shown in the figure. What is the tension in the string at the lowest point B?

a) 44.1 N

b) 29.4 N

c) 14.7 N

d) 22.1 N
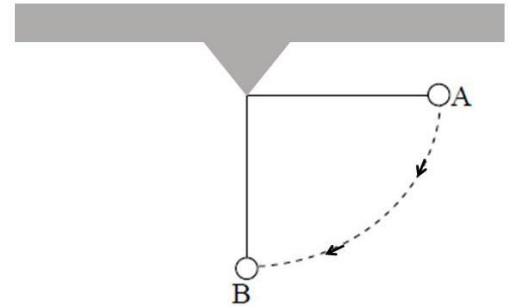
7) A sphere of mass 7 kg is dropped from rest from a height of $h = 2.8$ m above the top of a spring of spring constant 1180 N/m mounted vertically on the floor as shown. What will be the maximum compression in the spring?

a) 79.1 cm

b) 44.7 cm

c) 63.2 cm

d) 12.2 cm
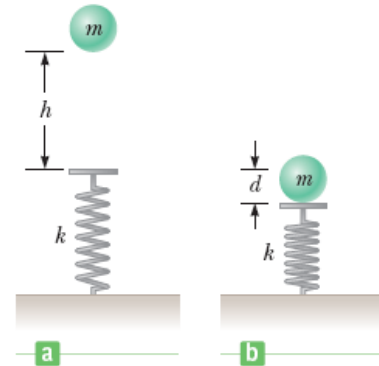
8) A 4 kg ball moving east at a speed of 18 m/s undergoes a head-on collision with a 6 kg ball moving west with a speed of 8 m/s. The two balls stick to each other after the collision. Calculate the lost kinetic energy during this collision.

a) 28.8 J   b) 648 J   c) 840 J   d) 811.2 J

9) In the figure shown, calculate the net torque about point O done on the 2 kg uniform rod by the two forces shown in addition to its weight.

a) 77 N.m clockwise

b) 77 N.m counterclockwise

c) 33 N.m clockwise

d) 33 N.m counterclockwise

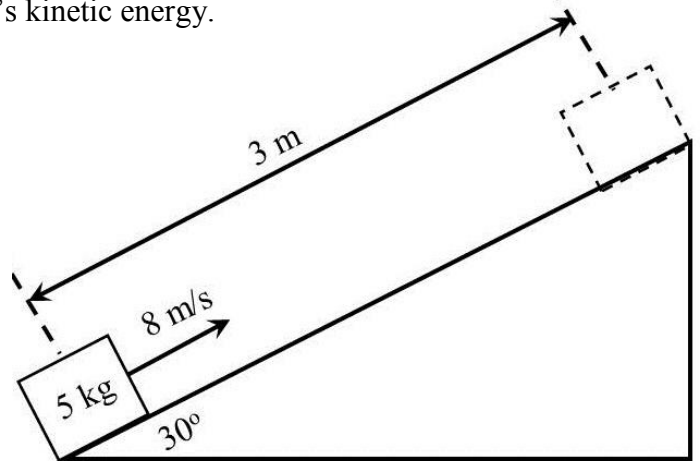$F_2 = 12.00$ N

$F_1 = 8.00$ N

30°

O

2 m

3 m

mg
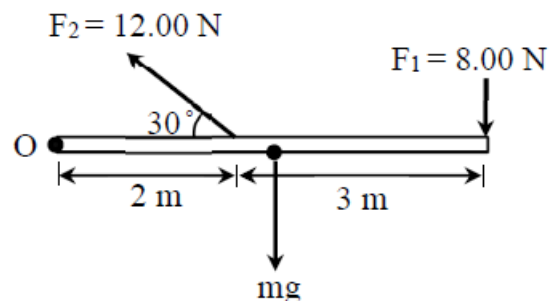
Part 3: Solve the following three problems in the space provided in between showing all your steps (4 marks each):

Problem 1 (4 marks):

A 5 kg block is set into motion up a rough inclined plane ($\theta = 30^{\circ}$) with an initial speed of 8 m/s as shown. The block comes to rest after moving 3 m along the plane.

a) (1 mark) calculate the change in the block's kinetic energy.

b) (1 mark) calculate the work done by gravity during this motion.

c) (1 mark) calculate the work done by friction on the block during this motion.

d) (1 mark) calculate the coefficient of kinetic friction between the block and the incline.

Problem 2 (4 marks):

A bullet of mass 20 g is fired into a ballistic pendulum of mass 3 kg initially at rest. The bullet exits from the other side of the ballistic pendulum with a speed of 100 m/s while the ballistic pendulum swing through an arc reaching a maximum height of 20.41 cm.

Before   After

3 kg

20.41 cm

3 kg   100 m/s
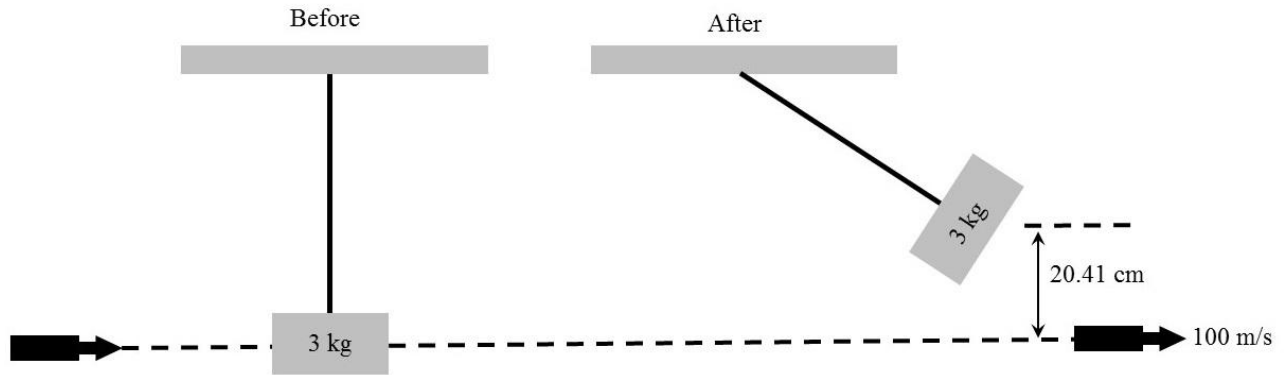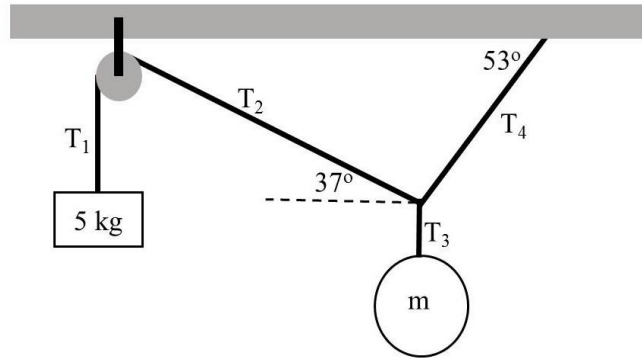
a) (1.5 marks) Calculate the speed of the ballistic pendulum just after the collision.

b) (1.5 marks) Calculate the speed of the bullet before it hits the ballistic pendulum.

c) (1 mark) Calculate the lost kinetic energy in this collision.

Problem 3 (4 marks):

In the shown figure, the system is at rest, the pulley and ropes are massless and the pulley is frictionless. Calculate the tensions in all ropes (T_1, T_2, T_3, and T_4) and the mass of the hanged ball.

Scratch Paper