PRINCE SULTAN UNIVERSITY
جامعة الأمير سلطان

Department of Mathematics and General Sciences

Physics 1 (PHY105)
Second Major Exam

First Semester, Term 141
Date: Tuesday 2/12/2013

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

Important instructions:

1. Examination time: 60 minutes.
2. Write your name 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
5. You may *not* borrow a calculator.
6. Use $g = 9.8$ m/s^2.

Good Luck!

	Mark
Part 1	/10
Part 2	/5
Total	/15

Part 1 (10 points total):
Indicate the answer choice that best completes the statement or answers the question.

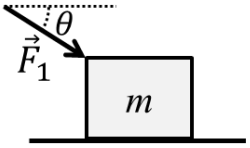
Q1. Which of the following is an example of a nonconservative force?
a) gravity b) friction c) spring d) both a and c

Q2. The total power required to accelerate a 1200 kg car from rest to 20 m/s in 4 seconds is:
a) 2 kW b) 20 kW c) 60 kW d) 6 kW

Q3. If the net work required to stop a car moving at a velocity of v is W, what is the net work required to stop a car moving at $2v$?
a) $4W$ b) $2W$ c) $6W$ d) $W/2$

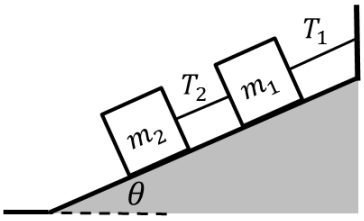
Q4. A 5 kg object moves on a rough horizontal surface with a constant velocity when a constant horizontal force of 12 N acts on it. What is the coefficient of kinetic friction between the object and the surface?
a) 0.60 b) 0.24 c) 0.12 d) 0.36

Q5. What is the magnitude of the normal force acting on the mass m shown in the figure?



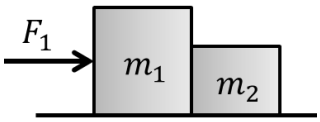
a) $mg + F_1 \sin\theta$ b) $mg + F_1 \cos\theta$
c) $mg - F_1 \sin\theta$ d) $mg - F_1 \cos\theta$

Q6. Two blocks of masses m_1 and m_2 are held in equilibrium on a frictionless incline as in the figure. What is the magnitude of the tension T_1 in the upper cord?



a) $(m_1 + m_2)g\cos\theta$ b) $(m_2 - m_1)g\cos\theta$
c) $m_1 g \sin\theta$ d) $(m_1 + m_2)g\sin\theta$

Q7. Two blocks $m_1 = 2$ kg and $m_2 = 1$ kg are placed on a frictionless surface in contact with each other, as shown. When the horizontal force $F_1 = 6$ N acts on m_1 the system moves with an acceleration of 2 m/s^2. What is the magnitude of the contact force between the blocks?



a) 1 N b) 2 N c) 3 N d) 4 N

Q8. A worker pushes a crate with a force of 40 N over a horizontal distance of 6.0 m. If a frictional force of 24 N acts on the crate, what net work is done on the crate?
a) 240 J b) 216 J c) 144 J d) 96 J

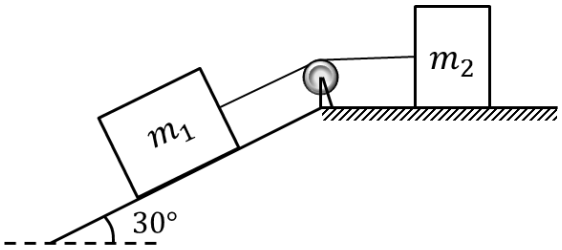
Q9. A 60 kg student stands on a bathroom scale in an elevator and it reads 788 N. What is the acceleration of the elevator?
a) 3.3 m/s^2 upward b) 3.3 m/s^2 downward
c) 22.9 m/s^2 upward d) 22.9 m/s^2 downward

Q10. A hill is 100 m long and makes an angle of 12° with the horizontal. As a 50 kg jogger runs up the hill, how much work does gravity do on the jogger?
a) 47.9 kJ b) 10.2 kJ c) –10.2 kJ d) – 49 kJ

Part 2 (5 points total):
Solve the following two problems in the provided space. *Show your steps and include the appropriate units*.

Q1. (3 points) Two blocks $m_1 = 4$ kg and $m_2 = 2$ kg are connected by a light string and a massless frictionless pulley, as shown. The inclined surface ($\theta = 30°$) is frictionless, while the coefficient of kinetic friction between m_2 and the horizontal surface is 0.2.

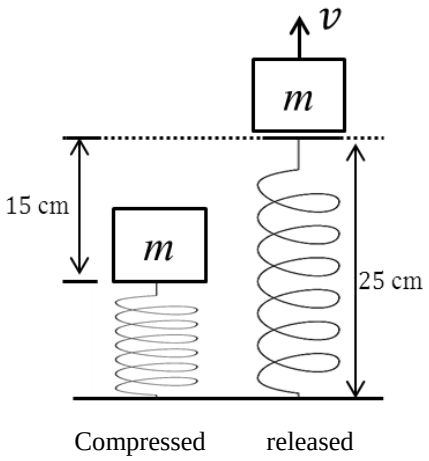
a) Draw a free body diagram for each block.
b) Calculate the acceleration of the system.
c) Calculate the tension in the string.



Q2. (2 points) A 25 cm long spring with a spring constant of $k = 400$ N/m is mounted vertically on a table. The spring was compressed by 15 cm and a block of mass $m = 2$ kg is placed on its end. The system was then released. Neglecting the mass of the spring and all frictional forces, calculate:

a) The speed v of the block as it leaves the spring

b) The maximum height the block reaches from the table.



Scratch sheet. Keep attached