Prince Sultan University

Department of Mathematics and General Sciences

Physics I (PHY105)
Second Major Exam

First Semester, Term 121
Date: Sunday 2/12/2012

Name:

ID#:

Section #:

Important instructions:

1. Write your name now before starting with the questions.
2. Check that you have 5 pages in total, including this cover page and a blank page.
3. **Examination time: 75 Minutes.**
4. Put any books/notebooks/sheets away.
5. You may use a calculator but you may ***not*** borrow a calculator from anyone.
6. You may ***not*** use your mobile phone ***at all***. Also, you may ***not*** use it as a calculator.
7. Any cheating signs may cause you to be expelled from the exam.
8. In this exam use $\boldsymbol{g = 10\ m/s^2}$ (g = acceleration of gravity on Earth).

Good Luck!

For Instructor's use only:

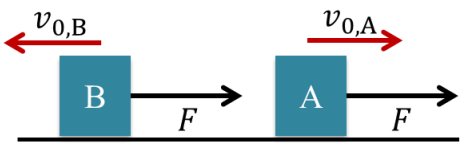
	Maximum	Student's marks
Part 1	(12 points)	
Part 2	(6 points)	
TOTAL	(18 points)	/15

Part 1: Twelve multiple choice questions (one mark each). Circle ◯ the letter of the correct answer. Use **pen** only.

Q1. In the absence of external forces, a *moving* object will:
a) move faster and faster.
b) stop immediately.
c) continue moving with constant acceleration.
d) continue moving with constant velocity.
e) Any of the above is possible, because it depends on object's mass.

Q2. You stand on a bathroom scale in an elevator accelerating downward. The reading of the scale (your apparent weight) will be:
a) less than your actual weight.
b) equal to your actual weight.
c) larger than your actual weight.
d) It depends on elevator's direction of motion (ascending or descending).
e) It depends on elevator's direction of motion and on its speed as well.

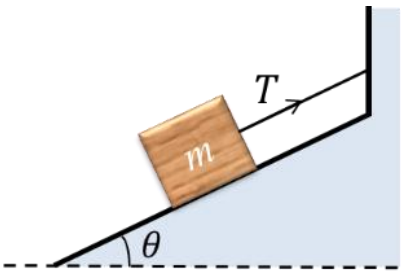
Q3. Two *identical* objects are sliding on a smooth surface. Object A is moving with a speed of $v_{0,A} = 5.0$ m/s to the right, while object B is moving with a speed of $v_{0,B} = 5.0$ m/s to the left. An equal net force of 5.0 N to the right started to act on *each* of the two objects. Which of the following is correct?



a) The acceleration of A will be larger than the acceleration of B.
b) The acceleration of B will be larger than the acceleration of A.
c) Objects A and B will accelerate with exactly the same acceleration.
d) The acceleration of object B will be zero.
e) Objects A and B will have opposite accelerations.

Q4. Which of the following better represents Newton's *second law* of motion:
a) The kinetic friction force acting on a sliding object is directly proportional to the normal force.
b) Forces occur in pairs; for every action there is a reaction.
c) The acceleration of an object is directly proportional to the net force on the object and inversely proportional to its mass.
d) The acceleration of an object is directly proportional to the net force on the object and directly proportional to its mass.
e) If the net force acting on an object is zero it will directly stop.

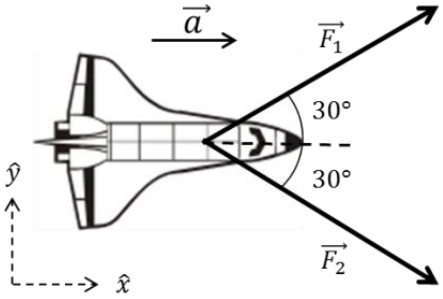
Q5. A 20 kg crate is placed on an inclined frictionless surface and attached to a wall using a string, as shown in the figure. If the surface is inclined by an angle of $\theta = 30°$ above the horizontal, the tension T in the string is:



a) 100 N
b) 200 N
c) 346 N
d) 173 N
e) 400 N

Q6. In the previous question, the *normal force* exerted by the surface on the box is:
a) 100 N b) 200 N c) 346 N d) 173 N e) 400 N

Q7. A space shuttle in the outer space with a mass of 70,000 kg is affected by the two forces $\overrightarrow{F_1}$ and $\overrightarrow{F_2}$, as shown in the figure. The forces are $F_1 = F_2 = 120{,}000$ N and they act in the shown directions. The acceleration of the space shuttle is:



a) 4.16 m/s^2
b) 2.97 m/s^2
c) 1.48 m/s^2
d) 1.71 m/s^2
e) 2.40 m/s^2

Q8. While driving you break for 1.5 seconds to slow your 1000 kg car from 15 m/s to 9 m/s. The magnitude of the average net force acted on your car during breaking is:

a) 3000 N
b) 4000 N
c) 30,000 N
d) 40,000 N
e) 10,000 N

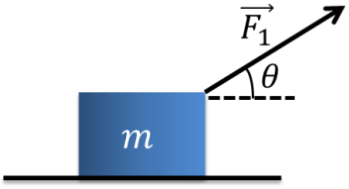
Q9. You drive your car on a circular path of radius 30 m. If the coefficient of static friction between the tires and the road is 0.7, at what maximum speed you can drive your car before skidding?

a) 1.18 m/s
b) 30.0 m/s
c) 21.0 m/s
d) 11.8 m/s
e) 14.5 m/s

Q10. A spring with a force constant of 140 N/m is compressed using 20 N of force. The resulting change in the length of the spring is:

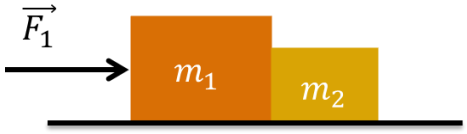
a) 8.0 m
b) 7.0 m
c) 7.0 cm
d) 14.3 cm
e) 12.5 cm

Q11. In the shown figure, a 50 kg crate on a horizontal surface is being pulled by a 100 N force at $\theta = 30°$ above the horizontal. The crate is moving at a constant velocity. The coefficient of kinetic friction μ_k between the crate and the surface is:



a) 0.19
b) 0.12
c) 0.28
d) 0.20
e) 0.24

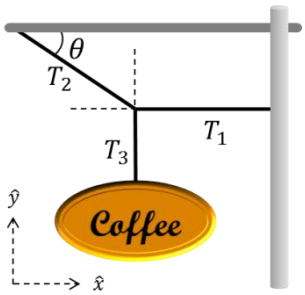
Q12. A horizontal force of magnitude 10 N pushes two boxes with masses $m_1 = 2.5$ kg and $m_2 = 1.2$ kg placed on a smooth horizontal surface as show in the figure. The acceleration of box 1 (mass m_1) is:



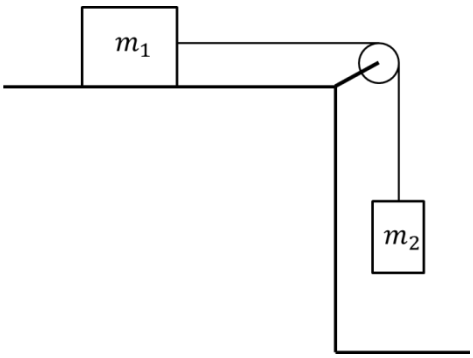
a) 4.5 m/s^2 b) 3.1 m/s^2 c) 4.0 m/s^2 d) 4.8 m/s^2 e) 2.7 m/s^2

Part 2: Solve the following **two** problems (three marks each) in the provided space. *To get the full mark show your work **in details***. Use **pen** only.

Q1. A coffee shop sign that weights 100 N is hanged using three wires as shown in the figure. If the angle $\theta = 37.0°$, find the tension in each wire ($T_1, T_2,$ and T_3).



Q2. A block of mass $m_1 = 3.0$ kg placed on a frictionless tabletop is connected to a string that passes through a pulley and suspends mass m_2 = 1.0 kg, as shown in the figure. Calculate (a) the acceleration of the system and (b) the tension in the string.



This blank sheet is for your use. NOTHING on this sheet will be considered in grading