Name: _____ Total Points: _____
(Last) (First)

Physics 201

Exam 2

Write also your name in the appropriate box of the scantron

Name: _____ Total Points: _____
(Last) (First)

Multiple choice questions [60 points]

Answer all of the following questions. Read each question carefully. **Fill the correct bubble on your scantron sheet**. Each correct answer is worth 4 points. Each question has exactly one correct answer.

1. You take the elevator from the first to the fourth floor. The normal force acting on you by the elevator does zero work.

A. **True**
B. **False**

2. You are standing on your skateboard. Your friend gives a gentle push to the skateboard. The friction force acting on you by the skateboard does

A. **negative work**
B. **zero work**
C **positive work**

3. You place a ruler on a sheet of paper on a horizontal table. You pull the sheet fast and hard enough so that the ruler slides on the paper. The friction force acting on the ruler by the paper does

A. **negative work**
B. **zero work**
C **positive work**

4. Normal forces are always directed vertically upward.

A. **True**
B. **False**

5. Gravity is a conservative force

A. **True**
B. **False**

6. Kinetic friction is a conservative force

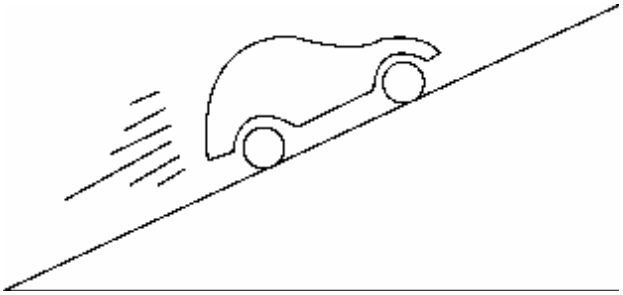
A. **True**
B. **False**

Name: _____ Total Points: _____
(Last) (First)

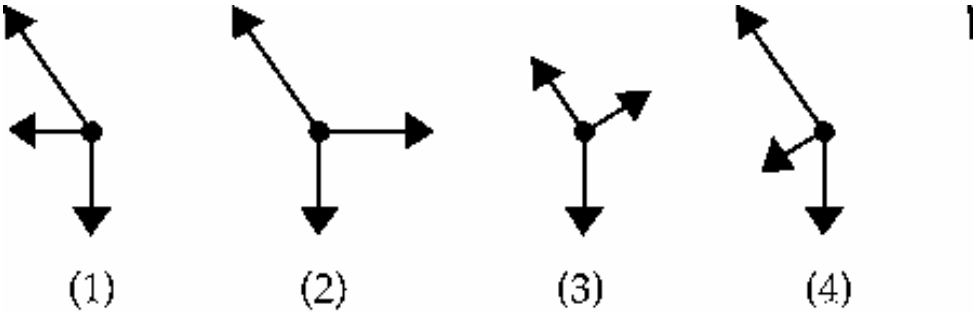
7. When a particle moves on a circle, the acceleration of the particle is always directed toward the center of the circle

A. `True`
B. `False`

8.



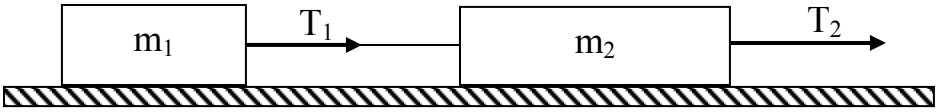
Which of the following free-body diagrams represents the car going uphill at a constant speed?



A. `(1)`
B. `(2)`
C. `(3)`
D. `(4)`

Name: _____ Total Points: _____
(Last) (First)

9. Two masses m_1 and m_2, connected by a massless string, are accelerating uniformly on a frictionless surface as shown. What is the ratio of the tensions T_1/T_2?

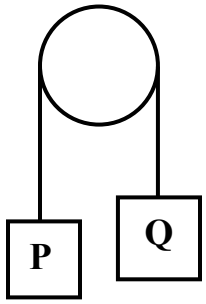


A. m_1/m_2
B. m_2/m_1
C. $(m_1 + m_2)/m_1$
D. $m_1/(m_1 + m_2)$
E. $m_2/(m_1 + m_2)$

Name: _____ Total Points: _____
(Last) (First)

Questions 10 through 15 all refer to the same problem.

Blocks P and Q are connected by a massless, inextensible string that runs over a frictionless peg. The masses of block P and Q are M_P and M_Q. M_P is less than M_Q.



10 The magnitude of the net force on block P is

A. less than $M_P g$
B. equal to $M_P g$
C. greater than $M_P g$ but less than $M_Q g$
D. equal to $M_Q g$
E. greater than $M_Q g$

At time t_1, block P is moving down with speed v_1=4cm/s. At time $t_2 > t_1$, it has speed v_2=2cm/s directed down. Between t_1 and t_2, block P moves 10 cm down. Questions 11 through 15 refer to this time interval.

11 The sign of the net work done on block P is

A. positive
B. negative
C. zero

12 The sign of the work done on block P by the string is

A. positive
B. negative
C. zero

13 Compare the absolute value of the work done on block P by the string ($|W_{PS}|$) to the absolute value of the work done on block P by the Earth ($|W_{PE}|$)

A. $|W_{PS}|$ is greater than $|W_{PE}|$
B. $|W_{PS}|$ is less than $|W_{PE}|$
C. $|W_{PS}|$ is equal to $|W_{PE}|$

Name: _____ Total Points: _____
(Last) (First)

14 The sign of the work done on block Q by the string (W_{QS}) is

A. positive
B. negative
C. zero

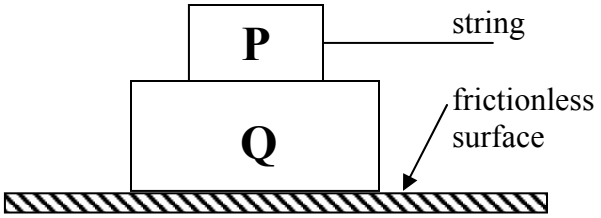
15 Compare the absolute value of the work done on block P by the string ($|W_{PS}|$) to the absolute value of the work done on block Q by the string ($|W_{QS}|$).

A. $|W_{PS}|$ is greater than $|W_{QS}|$
B. $|W_{PS}|$ is less than $|W_{QS}|$
C. $|W_{PS}|$ is equal to $|W_{QS}|$

Name: _____ Total Points: _____
(Last) (First)

PROBLEM [40 points]

A string pulls on block P, which is on top of block Q. Block Q has mass m_Q and block P has mass m_P. The coefficients of friction between P and Q are μ_s(static) and μ_k(kinetic). The acceleration of gravity is g. Neglect friction between block Q and the table.



For questions 1-4 assume that block P does not slip on block Q.

1). [3 pts] In the spaces provided, indicate the directions of the velocities, accelerations, and net forces of each block. If any of these is zero, state so explicitly. (The velocity of P is given.)

	v	a	F_{net}
P	→		
Q			

2). [10 pts] Draw free-body diagrams for blocks P and Q. Label each arrow to indicate: the type of force, the object the force is exerted on, and the object the force is exerted by.

Block P

Block Q

3). [8 pts] Write an expression for the maximum acceleration of block P if it does not slip on block Q. Your expression should only use quantities taken from this list: m_P, m_Q, g, μ_s and μ_k

Name: _____ Total Points: _____
(Last) (First)

4). [8 pts] Write an expression for the maximum tension in the string if block P does not slip on block Q. Your expression should only use quantities taken from this list: m_P, m_Q, g, μ_s and μ_k

For questions 5 and 6, assume that the force exerted by the string, T_{PS}, is sufficiently large that block P begins to slip on block Q.

5). [3 pts] Indicate the directions of the velocities, accelerations, and net forces of each block a short time after block P starts to slip. If any of these is zero, state so explicitly. (The velocity of P is given.)

	v	a	F_{net}
P	→		
Q			

6). [8 pts] Write an expression for the acceleration of block P. Your expression should only use quantities taken from this list: T_{PS}, m_P, m_Q, g, μ_s and μ_k