Miami-Dade College - Wolfson Campus
PHY1025 – Spring 2016
Exam-2

Name: Key

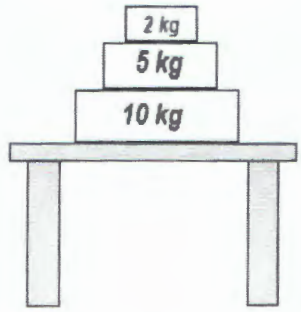
Section-1 Multiple-Choice

Directions: Read each question carefully and select the best answer. Write your responses on the line provided after each number..

1) D Ignoring air resistance, the horizontal component of a projectile's net force
A) continuously increases. B) remains constant.
C) continuously decreases. D) is zero.

2) D A ball is thrown directly upward and experiences no air resistance. Which one of the following statements about its motion is correct?
A) The net force on the ball is upward while it is traveling up and downward while it is traveling down.
B) The net force on the ball is downward while it is traveling up and upward while it is traveling down.
C) The net force on the ball is downward while it is traveling up and downward while it is traveling down but is zero at the highest point when the ball stops.
D) The net force on the ball is downward during the entire time the ball is in the air.

3) D Three blocks rest in a horizontal table as shown below.



The net force on the 2 kg block is
A) 170N
B) 150N
C) 20N
D) Zero

4) D Which of Newton's laws best explains why motorists should buckle-up?
A) the second law B) the third law
C) the law of gravitation D) the first law

5) C You are standing in a moving bus, facing forward, and you suddenly fall forward. You can imply from this that the bus's
A) velocity increased.
B) speed remained the same, but it's turning to the right.
C) velocity decreased.
D) speed remained the same, but it's turning to the left.

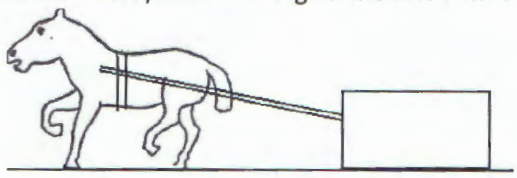
6) B A net force F accelerates a mass m with an acceleration a. If the same net force is applied to mass 2m, then the acceleration will be

A) 2a. B) a/2. C) a/4. D) 4a.

7) C A child's toy is suspended from the ceiling by means of a string. The Earth pulls downward on the toy with its weight force of 8.0 N. If this is the "action force," what is the "reaction force"?

A) The ceiling pulling upward on the string with an 8.0-N force.
B) The string pulling downward on the ceiling with an 8.0-N force.
C) The toy pulling upward on the Earth with an 8.0-N force.
D) The string pulling upward on the toy with an 8.0-N force.

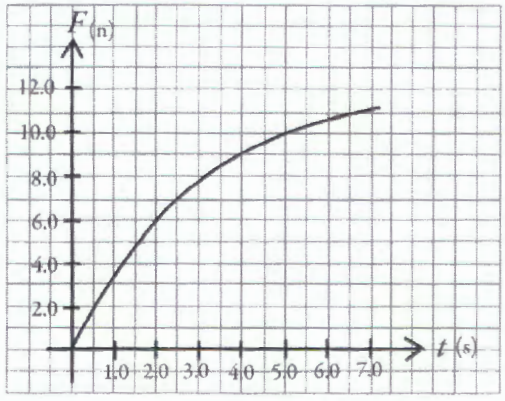
8) D The diagram below shows a horse-sled system moving to the left with constant velocity



If the force of friction between the sled and the ground is 2000 N, and horse the pulls the sled with 5000 N, the force exerted on the horse by the sled is most nearly:

A) 0 N
B) 2000 N
C) 3000 N
D) 5000 N

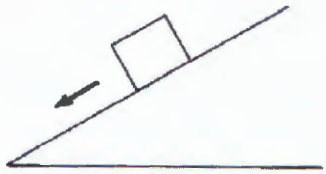
9) A The graph in the figure shows the net force acting on a 4-kg object as a function of time.



The acceleration of this object at time t = 3.0 s is:

A) 2.0 m/s^2
B) 4.0 m/s^2
C) 6.0 m/s^2
D) 8.0 m/s^2

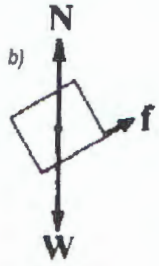
10)__D__ A crate slides down an incline plane as shown below.



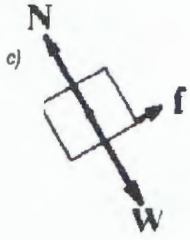
Which of the following diagrams best represents the forces acting on the crate?

a)

b)



c)

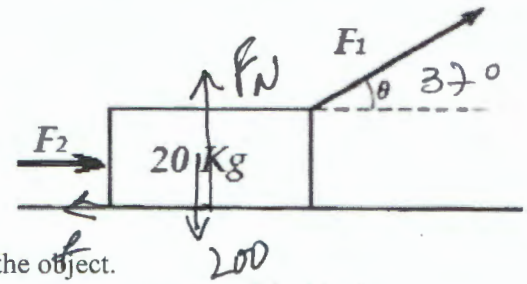


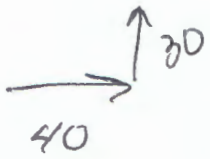
d)

QUESTION 2

A 20-kg block is dragged along a **rough horizontal** surface by two forces. $F_1 = 50$ N that acts at an angle $\theta = 37^0$ with the horizontal. $F_2 = 4$ N and acts horizontally. See figure below. **The system moves with a constant velocity.**

(15)





(2) A) Draw and label all other forces on the object.

(2) B) Use the dot shown below to draw a free-body diagram of the block.

(4) C) Calculate the force of friction on the block. (note that the coefficient of friction is not given)

$40 + 4 - f = 0$

$f = 44N$

(4) D) Calculate the vertical force exerted by the surface on the block. (Normal force).

$30 + F_N - 200 = 0$

$F_N = 200 - 30$

$F_N = 170N$

(3) E) Calculate the coefficient of kinetic friction, μ, between the block and the surface.

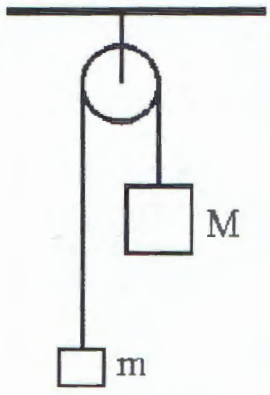
$\mu = \frac{f}{F_N} = \frac{44}{170} = 0.26$

SECTION II –FREE RESPONSE

Directions: Read each question carefully and write your responses in the space provided after each question. You MUST show work to receive credit.

QUESTION 1

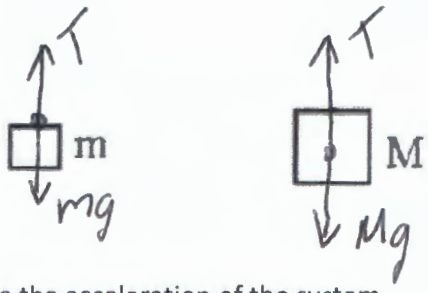
In the Atwood machine shown below, M = 6 kg and m = 4 kg, (Ignore friction and the mass of the pulley)



15

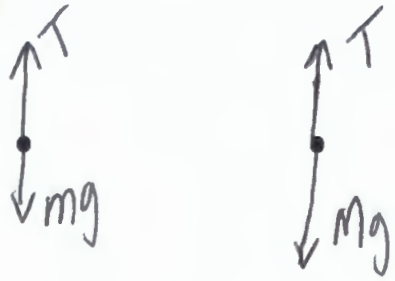
a) Draw and label all forces acting on blocks m and M.

4



b) Draw a free–body diagram for each block

3



c) Determine the acceleration of the system.

5

$T - 40 = 4a$

$60 - T = 6a$

$60 - 40 = 10a$

$a = \frac{20}{10} = 2\ m/s^2$

3

d) Determine the tension on the string.

$T - 40 = 4(2)$

$T = 48\ N$

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Section-1 Multiple-Choice

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Directions: Read each question carefully and select the best answer. Write your responses on the line provided after each number.

1) D A stalled car is being pushed up a hill at constant velocity by three people. The net force on the car is
A) up the hill and equal to the weight of the car.
B) up the hill and greater than the weight of the car.
C) down the hill and equal to the weight of the car.
D) zero.
E) down the hill and greater than the weight of the car.

2) B In the absence of an external force, a moving object will
A) stop immediately. B) move with constant velocity.
C) go faster and faster. D) slow down and eventually come to a stop.

3) D A constant net force acts on an object. Describe the motion of the object.
A) constant velocity B) increasing acceleration
C) constant speed D) constant acceleration

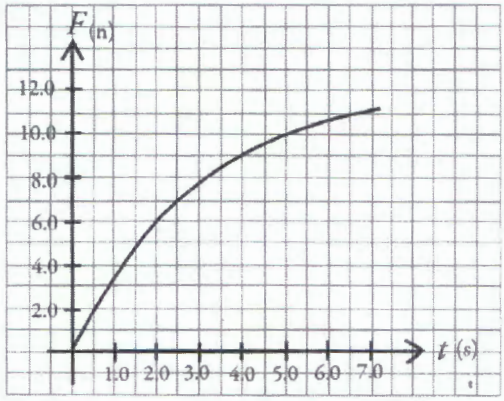
4) D A 20-ton truck collides with a 1500-lb car and causes a lot of damage to the car. Since a lot of damage is done on the car
A) the force on the truck is greater than the force on the car.
B) the truck did not slow down during the collision.
C) the force on the truck is smaller than the force on the car.
D) the force on the truck is equal to the force on the car.

5) B A stone is thrown straight up. At the top of its path, the net force acting on it is
A) greater than zero, but less than its weight. B) equal to its weight.
C) greater than its weight. D) instantaneously equal to zero.

6) D Ignoring air resistance, the horizontal component of a projectile's acceleration
A) continuously increases. B) continuously decreases.
C) remains a non-zero constant. D) is zero.

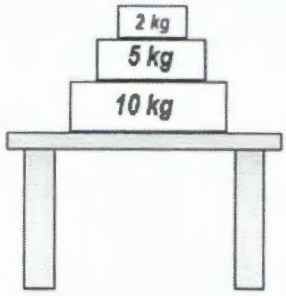
7) B A soccer ball is kicked with a velocity of 25 m/s at an angle of 45° above the horizontal. What is the vertical component of its acceleration as it travels along its trajectory?
A) (9.80 m/s^2) upward B) 9.80 m/s^2 downward
C) (9.80 m/s^2) × sin (45°) upward D) (9.80 m/s^2) × sin (45°) downward

8) B The graph in the figure shows the net force acting on a 2.5-kg object as a function of time.



The acceleration of this object at time t = 5.0 s is:

A) 2.0 m/s^2
B) 4.0 m/s^2
C) 6.0 m/s^2
D) 8.0 m/s^2



9) A The net force on the 10 kg block is

A) Zero
B) 70 N
C) 100 N
D) 170 N

10) E A fish weighing 16 N is weighed using two spring scales, each of negligible weight, as shown in the figure. What will be the readings of the scales?

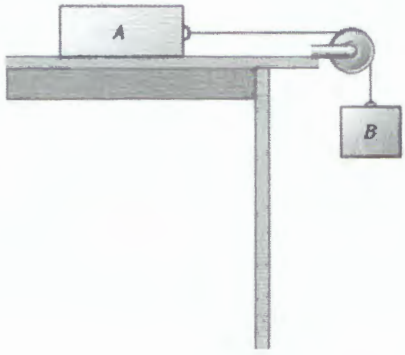
A) The scales will have different readings, but the sum of the two readings will be 16 N.
B) The bottom scale will read 16 N, and the top scale will read zero.
C) The top scale will read 16 N, and the bottom scale will read zero.
D) Each scale will read 8 N.
E) Each scale will read 16 N.

SECTION II –FREE RESPONSE

Directions: Read each question carefully and write your responses in the space provided after each question. You MUST show work to receive credit.

QUESTION 1

In the frictionless system shown below, block *A* (mass 6 kg) is connected to block *B* (mass 4 kg) by a light string that passes over a massless pulley.

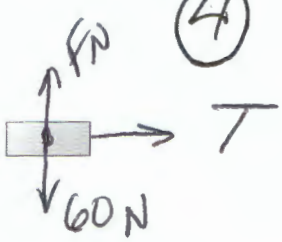


15

a) Draw and label all forces acting on blocks A and B.

b) Draw a free–body diagram for each block

4



3

5 c) Determine the acceleration of the system.

$T = 6a$

$40 - T = 4a$

$40 = 10a$

$a = 4\,m/s^2$

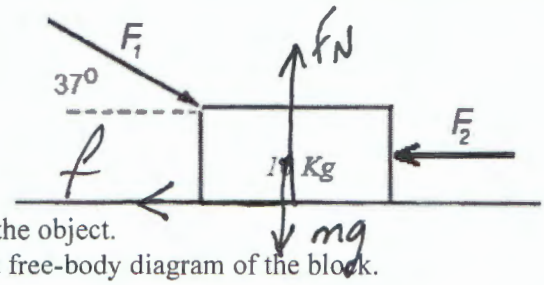
3 d) Determine the tension on the string.

$T = 6(4) = 24N$

QUESTION 2

A 10-kg block is pushed by two forces (F_1 = 10 N at a 37° below the horizontal, and a horizontal force F_2 = 4 N) along a **rough** horizontal surface as shown in the figure below. **The block moves with a constant velocity.**

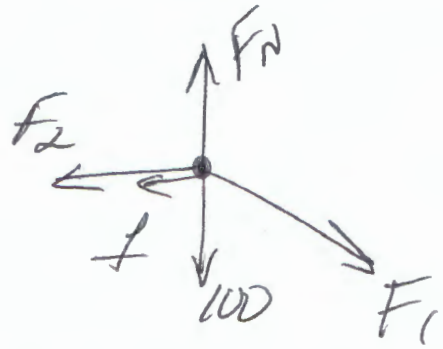
(15)



(2) A) Draw and label all other forces on the object.

B) Use the dot shown below to draw a free-body diagram of the block.

(2)



(4) C) Calculate the force of friction on the block. (note that the coefficient of friction is not given)

$8 - F_2 - f = 0$

$8 - 4 - f = 0$

$f = 4N$

(4) D) Calculate the vertical force exerted by the surface on the block. (Normal force).

$F_N - 100 - 6 = 0$

$F_N = 106N$

(3) E) Calculate the coefficient of kinetic friction, μ, between the block and the surface.

$\mu = \frac{f}{F_N} = \frac{4}{106} = 0.04$