Student #: _____ Student Name: _____

Physics 12 Homework Class 2: Dynamics

_____ 1. A ball is thrown up in the air and then caught at the same height. The acceleration is $9.81\,\mathrm{m/s^2}$ [down]

(a) on the way up
(b) on the way down
(c) at the peak of its trajectory
(d) two of A, B, and C are correct
(e) all of A, B, and C are correct

_____ 2. Which of the following involves a net force?

I. A ball on the end of a string travels in circular motion.
II. A space probe travels with a constant velocity in a straight line between planets.
III. An object has a constant horizontal velocity, but a decreasing vertical velocity.

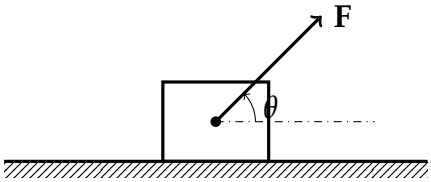
(a) I only
(b) I and II only
(c) II and III only
(d) I and III only
(e) I, II, and III

_____ 3. A small moving block collides with a large block at rest. Which of the following is true of the forces the blocks apply to each other

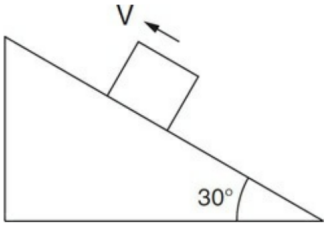
(a) The small block exerts twice the force on the large block compared to the force the large block exerts on the small block.
(b) The small block exerts half the force on the large block compared to the force the large block exerts on the small block.
(c) The small block exerts exactly the same amount of force on the large block that the large block exerts on the small block.
(d) The large block exerts a force on the small block, but the small block does not exert a force on the large block.
(e) The small block exerts a force on the large block, but the large block does not exert a force on the small block.

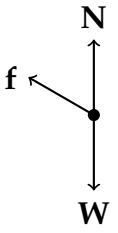
_____ 4. A force of magnitude $\mathbf{F}$ pulls up at an angle θ to the horizontal on a block of mass m. The mass remains in contact with the level floor and the coefficient of friction between the block and the floor is μ. The frictional force between the floor and the block is

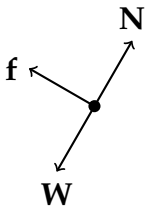
(a) μmg
(b) $\mu(mg - F\sin\theta)$
(c) $\mu(mg + F\sin\theta)$
(d) $\mu(mg - F\cos\theta)$
(e) $\mu(mg + F\cos\theta)$

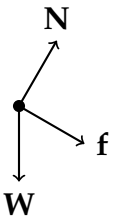


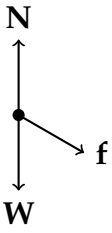
_____ 5. A $1\,\text{kg}$ block is sliding up a 30° incline and is slowing down with an acceleration of $-6\,\text{m/s}^2$. The mass has a weight $\mathbf{W}$, and encounters a frictional force $\mathbf{f}$ and a normal force $\mathbf{N}$. Which of the following free body diagrams best represents the forces acting on the block?

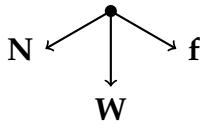


(a) 

(b) 

(c) 

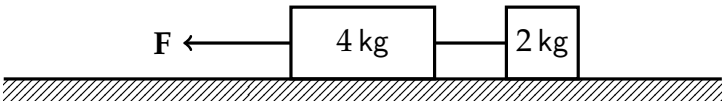
(d) 

(e) 

_____ 6. In the previous question, the magnitude of the frictional force $\mathbf{f}$ between the block and the plane is most nearly

(a) $1\,\text{N}$
(b) $2\,\text{N}$
(c) $3\,\text{N}$
(d) $4\,\text{N}$
(e) $5\,\text{N}$

_____ 7. Two blocks, $4\,\text{kg}$ and $2\,\text{kg}$, are connected by a string. An applied force $\mathbf{F}$ of magnitude $18\,\text{N}$ pulls the blocks to the left. The acceleration of the $4\,\text{kg}$ block is



(a) $2.0\,\text{m/s}^2$
(b) $3.0\,\text{m/s}^2$
(c) $4.0\,\text{m/s}^2$
(d) $4.5\,\text{m/s}^2$
(e) $6.0\,\text{m/s}^2$

_____ 8. In the previous question, the tension in the string between the blocks is

(a) $4.0\,\text{N}$
(b) $6.0\,\text{N}$
(c) $12\,\text{N}$
(d) $16\,\text{N}$
(e) $18\,\text{N}$

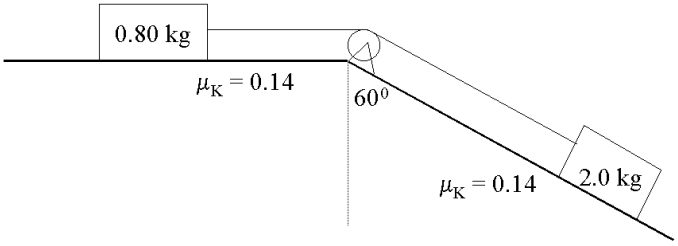
9. A curling stone with mass $20.0\,\text{kg}$ leaves the curler's hand at a speed of $0.885\,\text{m/s}$. It slides $31.5\,\text{m}$ down the rink before coming to rest.

(a) Draw a free-body diagram of the curling stone after it leaves the curler's hand
(b) Find the average force of friction acting on the stone
(c) Find the coefficient of kinetic friction between the ice and the stone
(d) How far would the curling stone travel if its mass was reduced to $15.0\,\text{kg}$?

10. A skier coasts down a 3.5° slope at constant speed.

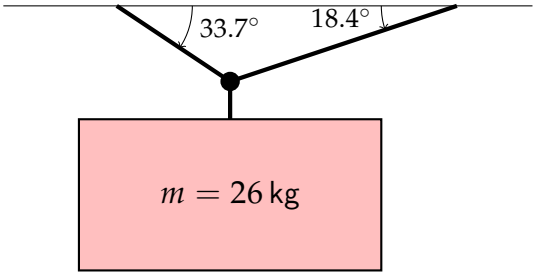
(a) Draw a free-body diagram of the skier.
(b) Find the coefficient of kinetic friction between the skis and the snow covering the slope.

11. Two blocks are connected by a massless string over a frictionless pulley as shown in the diagram.
    (a) Determine the acceleration of the blocks.
    (b) Calculate the tension in the string.



12. A $64\,\text{kg}$ person is standing on a scale in an elevator that is going down at a constant velocity. Then, the elevator begins to slow and eventually comes to a stop. The magnitude of the acceleration is $0.73\,\text{m/s}^2$.
    (a) What is the direction of the acceleration?
    (b) What is the reading on the scale while the elevator is accelerating?

13. One method to increase the storage space in a very small house is to hand storage bins from the ceiling using ropes. In this example, a $26\,\text{kg}$ bin is hung from the ceiling using two ropes of different tension, as shown in the diagram. What is the tension in each of the ropes?



14. In the figure below, m_1 does not slide with respect to the surface when a horizontal force $\mathbf{F}_a$ is applied. With the help of free-body diagrams on each mass, determine the magnitude of $\mathbf{F}_a$. Assume there is no friction.