CL2 AP Dynamics 2

1. When you move your hand back-and-forth you feel the slight drag of air resistance. However when you put your hand out a moving car window, the drag is significantly greater; demonstrating the effect of velocity on air resistance.

A cardboard model rocket accelerates straight upwards at 90 m/s^2 for 1 second and then is un-powered. The rocket continues upwards until it reaches its apogee (highest point) and, then falls to the Earth. Which of the following best describes the magnitude of the acceleration of the rocket in the interval starting moments before the apogee and ending moments after the apogee?

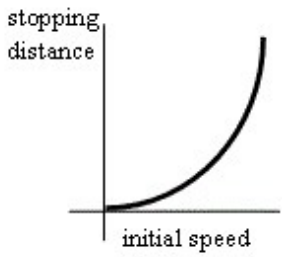
A. The acceleration decreases to zero and then increases.
B. The acceleration increases to g and then decreases from g.
C. The acceleration decreases to g and then continues to decrease.
D. The acceleration increases to g and then continues to increase.
E. The acceleration decreases to g and then increases from g.

2. When you move your hand back-and-forth you feel the slight drag of air resistance. However when you put your hand out a moving car window, the drag is significantly greater, demonstrating the effect of velocity on air resistance.

A cardboard model rocket is launched upwards with an acceleration of 90 m/s^2 for 1 second and then is un-powered. Which of the following best describes the direction and magnitude of the velocity and acceleration in the first second immediately after the thrust stops?

A. The velocity is up and increasing and the acceleration is down and increasing.
B. The velocity is up and decreasing and the acceleration is down and decreasing.
C. The velocity is down and increasing and the acceleration is down and increasing.
D. The velocity is down and decreasing and the acceleration is down and decreasing.
E. The velocity is up and decreasing and the acceleration is down and increasing.
F. The velocity is up and increasing and the acceleration is down and decreasing.

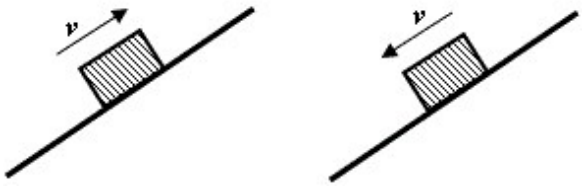
3.



This parabolic curve represents the distance a car takes to stop after the brakes are applied as a function of the initial speed of the car. The data indicates that, as the initial speed increases, the acceleration of the car during braking

A. increases quadratically (a is proportional to v_i^2)
B. increases linearly (a is proportional to v_i)
C. remains the same
D. decreases quadratically (a is inversely proportional to v_i^2)
E. decreases linearly (a is inversely proportional to v_i)

4.



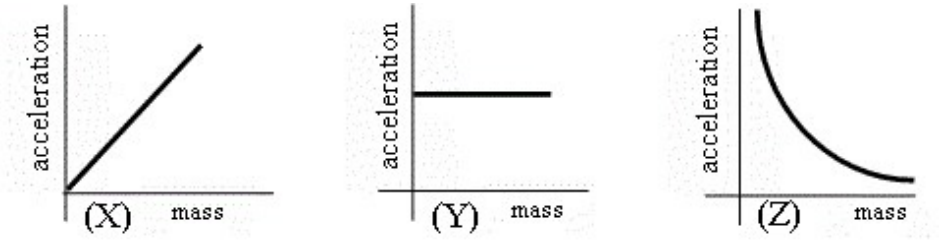
The diagrams show a block moving up and down an incline at constant speed by an external applied force (F_{appl}) exerted in the direction of motion. Which of the following best describes the relative magnitudes of the applied force and the friction force (F_k) acting on the block in each case?

A. when moving up: $F_{appl} = F_k$ when moving down: $F_{appl} = F_k$
B. when moving up: $F_{appl} = F_k$ when moving down: $F_{appl} < F_k$
C. when moving up: $F_{appl} = F_k$ when moving down: $F_{appl} > F_k$
D. when moving up: $F_{appl} > F_k$ when moving down: $F_{appl} = F_k$
E. when moving up: $F_{appl} > F_k$ when moving down: $F_{appl} < F_k$
F. when moving up: $F_{appl} > F_k$ when moving down: $F_{appl} > F_k$

5. A wooden block rests on a horizontal plane. One end of the plane is lifted gradually until the block just starts to slide. While the angle is increasing but before the block starts the slide, what is happening to the magnitude of the static friction force acting on the block (F_s) and the maximum static friction force ($F_{s\,max}$)?

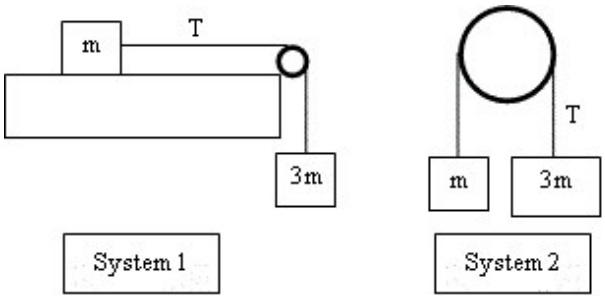
A. F_s increases while $F_{s\,max}$ decreases
B. F_s decreases while $F_{s\,max}$ increases
C. F_s increases while $F_{s\,max}$ remains the same
D. F_s decreases while $F_{s\,max}$ remains the same
E. F_s remains the same while $F_{s\,max}$ decreases
F. F_s remains the same while $F_{s\,max}$ increases
G. both increase
H. both decrease
I. both remain the same

6. Which of the graphs and explanations best describes the acceleration of a freely falling object near the surface of the Earth as a function to its mass?



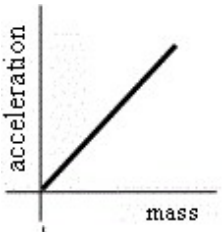
A. graph X because the net force on the object is independent of its mass
B. graph X because the net force on the object is directly proportional to its mass
C. graph Y because the net force on the object is independent of its mass
D. graph Y because the net force on the object is directly proportional to its mass
E. graph Z because the net force on the object is independent of its mass
F. graph Z because the net force on the object is directly proportional to its mass

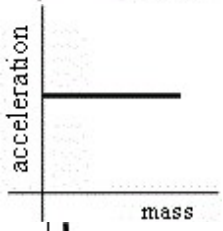
7. The diagrams represent 2 Atwood's machines with pulleys that can be assumed massless and frictionless. The surface supporting the mass in System 1 is frictionless. What is the relationship between the acceleration of the blocks in System 1 (a_1) to that in System 2 (a_2)?

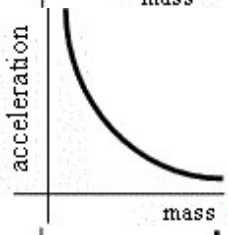


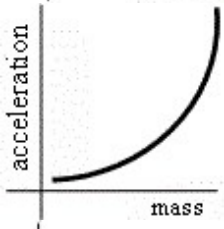
A. $a_1 > a_2$ because the net force on the system is greater.
B. $a_1 > a_2$ because the same net force acts on less mass.
C. $a_1 = a_2$ because the difference in the masses is the same.
D. $a_1 < a_2$ because the net force on the system is less.
E. $a_1 < a_2$ because the same net force acts on a greater mass.

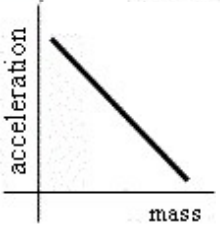
8. A constant net force acts on various masses. Which of the following graphs best represents the acceleration produced by the net force as a function of the mass it is applied to?

A.


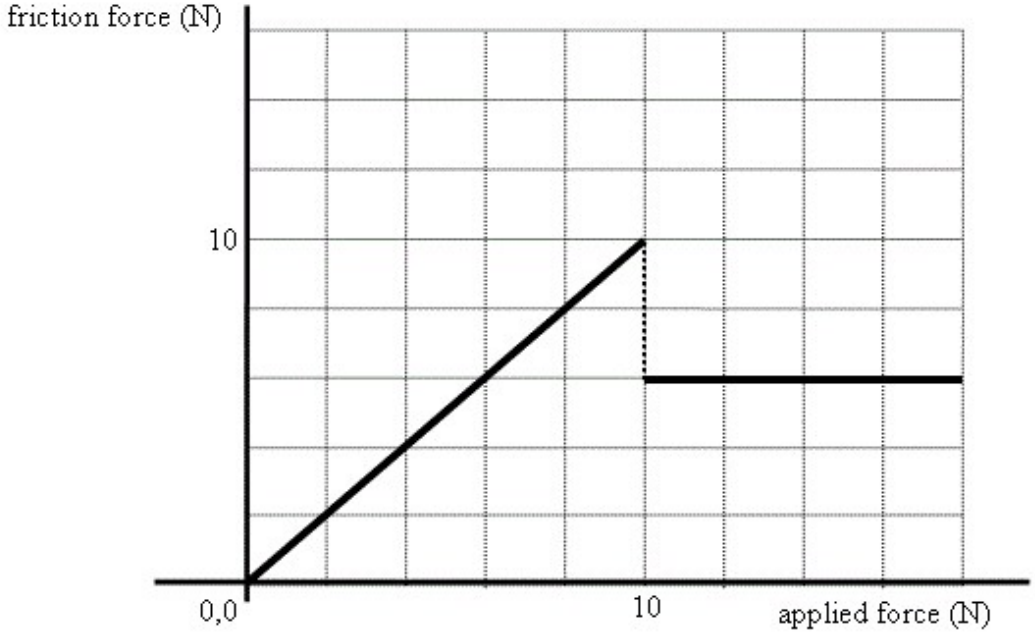
B.


C.


D.


E.


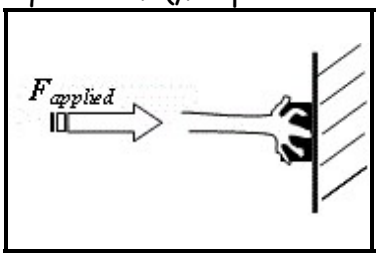
9. An applied force acts on a stationary 2kg block on a horizontal surface. The applied force is pushing west and is increased at a constant rate until it reaches 18N. The graph shows the friction force acting on the block during this process as a function of the applied force.



Which of the following best describes the motion of the block at the instant that the applied force equals 6N?

A. accelerating east because the friction force exceeds the applied force.
B. accelerating west because the friction force is less than the applied force.
C. moving at constant speed ($v \neq 0$) because the friction force equals the applied force.
D. at rest because the friction force exceeds the applied force.
E. at rest because the friction force equals the applied force.

10. A hand exerts a horizontal applied force on a block of mass m, pushing it against the wall and just keeping the block at rest. Some of the forces acting on the block are described in the following equalities. (μ represents the coefficient of static friction for the surfaces)

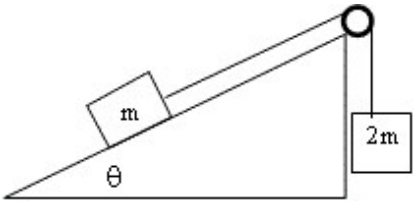


I: $F_{NORMAL} = F_{APPLIED}$
II: $\mu F_{APPLIED} = F_{NORMAL}$
III: $mg = \mu F_{APPLIED}$
IV: $F_{NORMAL} = mg$

Which of the equalities are true?

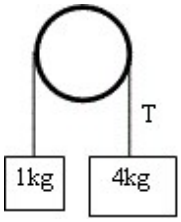
A. I & IV
B. I & III
C. III & IV
D. II & IV
E. II, III & IV

11. The diagram shows an ideal pulley system but non-smooth surfaces. If the blocks are moving at constant speed, which of the following expressions yields the coefficient of kinetic friction for these surfaces?



A. $\mu_k = (2 - \cos\theta) / \sin\theta$
B. $\mu_k = 2 / \cos\theta$
C. $\mu_k = (2 - \sin\theta) / \cos\theta$
D. $\mu_k = 2 / \sin\theta$

12. Assuming an ideal pulley, calculate the acceleration of system (a) and the tension (T) in the string connecting the two blocks?



A. a = 6 m/s^2 and T = 16 N
B. a = 6 m/s^2 and T = 4 N
C. a = 8 m/s^2 and T = 18 N
D. a = 8 m/s^2 and T = 8 N

Answer Key for CL2 AP1 Dynamics 2

Question 1: C	Question 2: B	Question 3: C
Question 4: E	Question 5: A	Question 6: D
Question 7: A	Question 8: C	Question 9: E
Question 10: B	Question 11: C	Question 12: A