

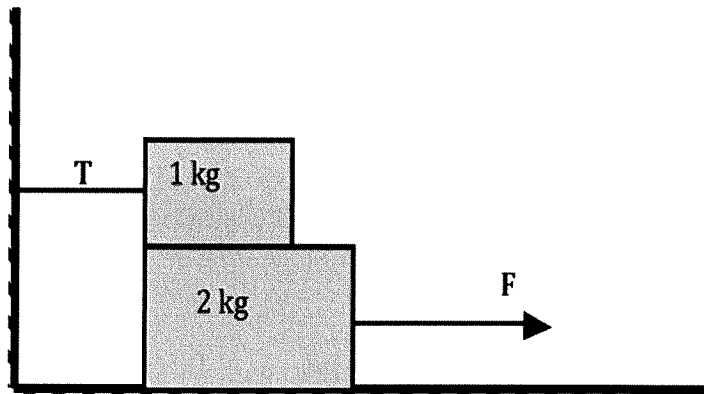
AP Physics – Unit 2 PRE-EXAM MC– Dynamics

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then enter the appropriate letter in the corresponding space on the answer sheet.

Note: To simplify calculations, you may use $g = 10 \text{ m/s}^2$ in all problems.

Questions 1 and 2 refer to the following material:

A block of mass 1.0 kg is sitting on top of a block of mass 2.0 kg. The 1.0 kg block is tied to a thin thread that extends horizontally to a wall where the other end is attached. The 2.0 kg block is pulled by an external horizontal force F with constant velocity to the right. The coefficient of kinetic friction between the two blocks is 0.5 and the coefficient of kinetic friction between the 2.0 kg block and the surface is 0.8.



1. As the bottom block is pulled to the right, the tension in the thread T is most nearly

- A) 0 N
- B) 1 N
- C) 5 N
- D) 8 N

2. The force, F , required to pull the bottom block with constant velocity is most nearly

- A) 0 N
- B) 15 N
- C) 24 N
- D) 29 N

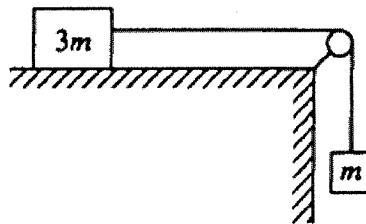
3. A 20-N bucket is at the bottom of a 9-m deep well and is initially at rest. The bucket is then pulled to the top of the well by a string that exerts a constant tension force such that it reaches the top in 3.0 s. During this interval, the tension in the string is

- A) 4 N
- B) 6 N
- C) 20 N
- D) 24 N

4. A ball falls straight down through the air under the influence of gravity. There is a retarding force F on the ball with magnitude given by $F = bv$, where v is the speed of the ball and b is a positive constant. The magnitude of the acceleration a of the ball at any time is equal to which of the following?

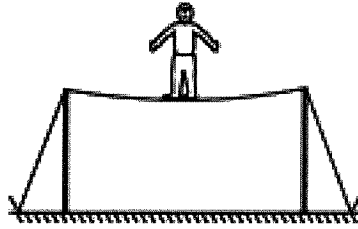
- A) $g - b$
- B) $g - \frac{bv}{m}$
- C) $g + \frac{bv}{mb}$
- D) $\frac{g}{b}$

5. A block of mass $3m$ can move without friction on a horizontal table. This block is attached to another block of mass m by a cord that passes over a frictionless pulley, as shown. If the masses of the cord and the pulley are negligible, what is the magnitude of the acceleration of the descending block?



- A) Zero
- B) $\frac{g}{4}$
- C) $\frac{g}{3}$
- D) $\frac{2g}{3}$

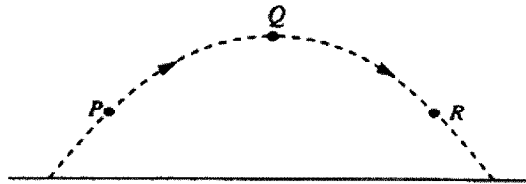
6. A circus performer of weight W is standing in the middle of a “high wire,” as shown. The tension in the wire is



- A) Approximately W
- B) Approximately $W/2$
- C) Much less than W
- D) Much greater than W

Questions 7–9 refer to the following material:

A ball is thrown and follows the parabolic path shown. Air friction is negligible. Point Q is the highest point on the path. Points P and R are the same height above the ground.



7. Which of the following best indicates the direction of the net force, if any, on the ball at point Q ?
- A) ↓
 - B) ←
 - C) →
 - D) ↘
8. How do the speeds of the ball at the three points compare?
- A) $v_P < v_Q < v_R$
 - B) $v_R < v_Q < v_P$
 - C) $v_Q < v_R < v_P$
 - D) $v_Q < v_P = v_R$

9. Which of the following diagrams best shows the direction of the acceleration of the ball at point P ?

- A) ↓
- B) ↗
- C) →
- D) ↘

Directions: For each of the questions or incomplete statements below, two of the suggested answers will be correct. For each of these questions, you must select both correct choices to earn credit. No partial credit will be earned if only one correct choice is selected. Select the two that are best in each case and then enter both of the appropriate letters in the corresponding space on the answer sheet.

10. A block of mass m rests on a table. You apply a small force to the block, but the block does not move. Which of the following are action/reaction pairs according to Newton's third law? Select two answers.

- A) The force due to gravity acting on the block and the normal force acting on the block
- B) The block's gravitational pull on Earth and Earth's gravitational pull on the block
- C) The applied force acting on the block and the frictional force acting on the block
- D) The block's push on the table and the table's push on the block

11. Students perform an experiment to determine the relationship between mass, acceleration, and net force using an Atwood machine, as pictured. Assuming that the pulley's mass is negligible as is its friction and that the mass of the string is negligible, which of the following quantities are needed to determine the acceleration due to gravity? Select two answers.

- A) The mass of each block
- B) The time it takes for the block to travel certain distance
- C) The tension in the string
- D) The radius of the pulley

