

## Critical Thinking Items

### 5.1 Vector Addition and Subtraction: Graphical Methods 16.

True or False—A person is following a set of directions. He has to walk 2 km east and then 1 km north. He takes a wrong turn and walks in the opposite direction for the second leg of the trip. The magnitude of his total displacement will be the same as it would have been had he followed directions correctly.

- a. True
- b. False

### 5.2 Vector Addition and Subtraction: Analytical Methods 17.

What is the magnitude of a vector whose x-component is  $2\sqrt{3}$  units and whose angle is  $60^\circ$ ?

- a.  $1.0\sqrt{3}$  units
- b.  $2.0\sqrt{3}$  units
- c.  $2.3\sqrt{3}$  units
- d.  $4.0\sqrt{3}$  units

18.

Vectors  $\vec{A}$  and  $\vec{B}$  are equal in magnitude and opposite in direction. Does  $\vec{A} - \vec{B}$  have the same direction as vector  $\vec{A}$  or  $\vec{B}$ ?

- a.  $\vec{A}$
- b.  $\vec{B}$

### 5.3 Projectile Motion 19.

Two identical items, object 1 and object 2, are dropped from the top of a 50.0 m building. Object 1 is dropped with an initial velocity of 0 m/s, while object 2 is thrown straight downward with an initial velocity of 13.0 m/s. What is the difference in time, in seconds rounded to the nearest tenth, between when the two objects hit the ground?

- a. Object 1 will hit the ground 3.2 s after object 2.
- b. Object 1 will hit the ground 2.1 s after object 2.
- c. Object 1 will hit the ground at the same time as object 2.
- d. Object 1 will hit the ground 1.1 s after object 2.

20.

An object is launched into the air. If the y-component of its acceleration is  $9.8 \text{ m/s}^2$ , which direction is defined as positive?

- a. Vertically upward in the coordinate system
- b. Vertically downward in the coordinate system

- c. Horizontally to the right side of the coordinate system
- d. Horizontally to the left side of the coordinate system

#### 5.4 Inclined Planes 21.

A box weighing  $500\text{ N}$  is at rest on the floor. A person pushes against it and it starts moving when  $100\text{ N}$  force is applied to it. What can be said about the coefficient of kinetic friction between the box and the floor?

- a.  $\mu_k = 0$
- b.  $\mu_k = 0.2$
- c.  $\mu_k < 0.2$
- d.  $\mu_k > 0.2$

22.

The component of the weight parallel to an inclined plane of an object resting on an incline that makes an angle of  $70^\circ$  with the horizontal is  $100\text{ N}$ . What is the object's mass?

- a.  $10.9\text{ kg}$
- b.  $29.8\text{ kg}$
- c.  $106\text{ kg}$
- d.  $292\text{ kg}$

#### 5.5 Simple Harmonic Motion 23.

Two springs are attached to two hooks. Spring A has a greater force constant than spring B. Equal weights are suspended from both. Which of the following statements is true?

- a. Spring A will have more extension than spring B.
- b. Spring B will have more extension than spring A.
- c. Both springs will have equal extension.
- d. Both springs are equally stiff.

24.

Two simple harmonic oscillators are constructed by attaching similar objects to two different springs. The force constant of the spring on the left is  $5\text{ N/m}$  and that of the spring on the right is  $4\text{ N/m}$ . If the same force is applied to both, which of the following statements is true?

- a. The spring on the left will oscillate faster than spring on the right.
- b. The spring on the right will oscillate faster than the spring on the left.
- c. Both the springs will oscillate at the same rate.
- d. The rate of oscillation is independent of the force constant.