Multiple Choice

5.1 Vector Addition and Subtraction: Graphical Methods 36.

True or False—We can use Pythagorean theorem to calculate the length of the resultant vector obtained from the addition of two vectors which are at right angles to each other.

a. True
b. False

37.

True or False—The direction of the resultant vector depends on both the magnitude and direction of added vectors.

a. True
b. False

38.

A plane flies north at 200\,\text{m/s} with a headwind blowing from the north at 70\,\text{m/s}. What is the resultant velocity of the plane?

a. 130\,\text{m/s} north
b. 130\,\text{m/s} south
c. 270\,\text{m/s} north
d. 270\,\text{m/s} south

39.

Two hikers take different routes to reach the same spot. The first one goes 255\,\text{m} southeast, then turns and goes 82\,\text{m} at 14^\circ! south of east. The second hiker goes 200\,\text{m} south. How far and in which direction must the second hiker travel now, in order to reach the first hiker's location destination?

a. 200\,\text{m} east
b. 200\,\text{m} south
c. 260\,\text{m} east
d. 260\,\text{m} south

5.2 Vector Addition and Subtraction: Analytical Methods 40.

When will the x-component of a vector with angle \theta be greater than its y-component?

a. 0^\circ! \lt \theta \lt 45^\circ
b. \theta = 45^\circ
c. 45^\circ! \lt \theta \lt 60^\circ
d. 60^\circ! \lt \theta \lt 90^\circ

41.

The resultant vector of the addition of vectors \overrightarrow{\text{a}} and \overrightarrow{\text{b}} is \overrightarrow{\text{r}}. The magnitudes of \overrightarrow{\text{a}}, \overrightarrow{\text{b}}, and \overrightarrow{\text{r}} are A, B, and R, respectively. Which of the following is true?

a. R_x + R_y = 0
b. A_x + A_y = \overrightarrow{\text{A}}
c. A_x + B_y = B_x + A_y
d. A_x + B_x = R_x

42.

What is the dimensionality of vectors used in the study of atmospheric sciences?

a. One-dimensional
b. Two-dimensional
c. Three-dimensional

5.3 Projectile Motion

43.

After a projectile is launched in the air, in which direction does it experience constant, non-zero acceleration, ignoring air resistance?

a. The x direction
b. The y direction
c. Both the x and y directions
d. Neither direction

44.

Which is true when the height of a projectile is at its maximum?

a. v_y = 0
b. v_y = \text{maximum}
c. v_x = \text{maximum}

45.

A ball is thrown in the air at an angle of 40°. If the maximum height it reaches is 10 m, what must be its initial speed?

a. 17.46 m/s
b. 21.78 m/s
c. 304.92 m/s
d. 474.37 m/s

46.

A large rock is ejected from a volcano with a speed of 30\,\text{m/s} and at an angle 60^\circ\! above the horizontal. The rock strikes the side of the volcano

at an altitude of 10.0\,\text{m} lower than its starting point. Calculate the horizontal displacement of the rock.

a. 84.90\,\text{m}
b. 96.59\,\text{m}
c. 169.80\,\text{m}
d. 193.20\,\text{m}

5.4 Inclined Planes 47.

For objects of identical masses but made of different materials, which of the following experiences the most static friction?

a. Shoes on ice
b. Metal on wood
c. Teflon on steel

48.

If an object sits on an inclined plane and no other object makes contact with the object, what is typically equal in magnitude to the component of the weight perpendicular to the plane?

a. The normal force
b. The total weight
c. The parallel force of weight

49.

A 5 kg box is at rest on the floor. The coefficient of static friction between the box and the floor is 0.4. A horizontal force of 50 N is applied to the box. Will it move?

a. No, because the applied force is less than the maximum limiting static friction.
b. No, because the applied force is more than the maximum limiting static friction.
c. Yes, because the applied force is less than the maximum limiting static friction.
d. Yes, because the applied force is more than the maximum limiting static friction.

50.

A skier with a mass of 67 kg is skiing down a snowy slope with an incline of 37°. Find the friction if the coefficient of kinetic friction is 0.07.

a. 27.66 N
b. 34.70 N
c. 36.71 N
d. 45.96 N

5.5 Simple Harmonic Motion 51.

A change in which of the following is an example of deformation?

a. Velocity
b. Length
c. Mass
d. Weight

52.

The units of amplitude are the same as those for which of the following measurements?

a. Speed
b. Displacement
c. Acceleration
d. Force

53.

Up to approximately what angle is simple harmonic motion a good model for a pendulum?

a. 15^\circ
b. 45^\circ
c. 75^\circ
d. 90^\circ

54.

How would simple harmonic motion be different in the absence of friction?

a. Oscillation will not happen in the absence of friction.
b. Oscillation will continue forever in the absence of friction.
c. Oscillation will have changing amplitude in the absence of friction.
d. Oscillation will cease after a certain amount of time in the absence of friction.

55.

What mass needs to be attached to a spring with a force constant of $7\,\text{N/m}$ in order to make a simple harmonic oscillator oscillate with a time period of $3\,\text{s}$?

a. $0.03\,\text{kg}$
b. $1.60\,\text{kg}$
c. $30.7\,\text{kg}$
d. $63.0\,\text{kg}$