The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Thursday, June 25, 2026 — 9:15 a.m. to 12:15 p.m., only

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Answer all questions in all parts of this examination according to the directions provided in the examination booklet.

A separate answer sheet for Part A and Part B–1 has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet. Record your answers to the Part A and Part B–1 multiple-choice questions on this separate answer sheet. Record your answers for the questions in Part B–2 and Part C in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

All answers in your answer booklet should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on your separate answer sheet or in your answer booklet as directed.

When you have completed the examination, you must sign the statement printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and answer booklet cannot be accepted if you fail to sign this declaration.

Notice. . .

A scientific or graphing calculator, a centimeter ruler, a protractor, and a copy of the *2006 Edition Reference Tables for Physical Setting/Physics*, which you may need to answer some questions in this examination, must be available for your use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part.

Directions (1–35): For *each* statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2006 Edition Reference Tables for Physical Setting/Physics.* Record your answers on your separate answer sheet.

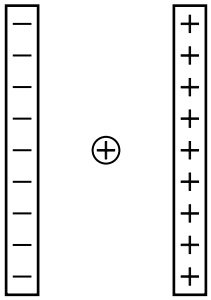
1 Which quantity is a scalar?

(1) acceleration
(2) force
(3) impulse
(4) work

2 Which unit can be used to express the strength of an electric field?

(1) coulomb per newton
(2) newton per coulomb
(3) newton•coulomb
(4) coulomb

3 The diagram below represents a positively charged test particle located between two charged, parallel plates near the surface of Earth.



Which force does *not* exist in this situation?

(1) an attractive electrostatic force between the test particle and the negative plate
(2) a repulsive electrostatic force between the test particle and the positive plate
(3) an attractive gravitational force between the test particle and Earth
(4) a repulsive gravitational force between the test particle and Earth

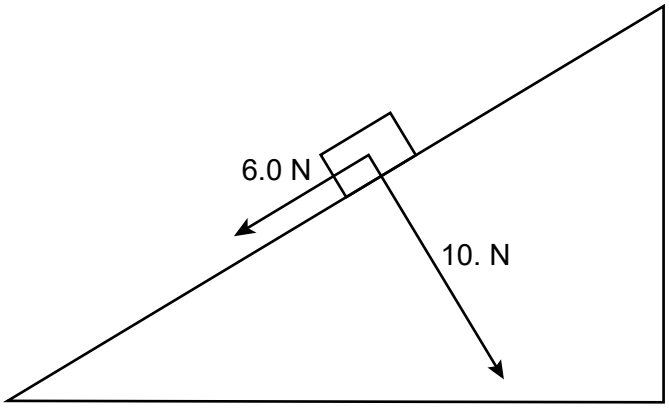
4 Electrostatic force F exists between two protons separated by a distance of 1×10^{-6} meter. If the distance between the protons is tripled, the electrostatic force between them will be

(1) $\frac{1}{3}F$
(2) $\frac{1}{9}F$
(3) $3F$
(4) $9F$

5 A loudspeaker vibrating with frequency f produces a sound wave by vibrating air molecules adjacent to the surface of the speaker. Which statement correctly describes both the direction and frequency of vibration of these air molecules?

(1) The air molecules vibrate parallel to the direction of wave travel at frequency f.
(2) The air molecules vibrate parallel to the direction of wave travel at a frequency other than f.
(3) The air molecules vibrate perpendicular to the direction of wave travel at frequency f.
(4) The air molecules vibrate perpendicular to the direction of wave travel at a frequency other than f.

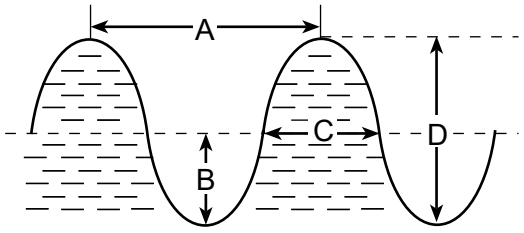
6 The diagram below represents perpendicular components of the weight of a crate resting on an incline. The component of the crate's weight acting parallel to the incline is 6.0 newtons and the component of the crate's weight acting perpendicular to the incline is 10. newtons.



The magnitude of the normal force acting on the crate is

(1) 6.0 N
(2) 10. N
(3) 12 N
(4) 16 N

7 The diagram below represents a wave.



The amplitude of the wave in the diagram is represented by distance

(1) *A*
(2) *B*
(3) *C*
(4) *D*

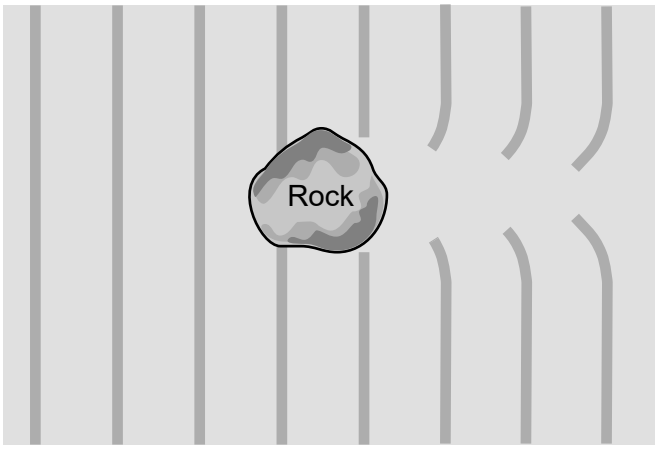
8 Astronauts in a space station orbiting Earth use radio waves to communicate with people on Earth. These radio waves traveling through space are

(1) transverse and mechanical
(2) longitudinal and mechanical
(3) transverse and electromagnetic
(4) longitudinal and electromagnetic

9 A package is dropped from a helicopter hovering 120 meters above the ground. How far does the package fall during the first 3.0 seconds? [Neglect air resistance.]

(1) 15 m
(2) 29 m
(3) 44 m
(4) 88 m

10 The diagram below shows an aerial view of water waves moving to the right in a small pond as they pass a large rock.



The spreading of the waves into the region to the right of the rock is an example of

(1) refraction
(2) diffraction
(3) reflection
(4) absorption

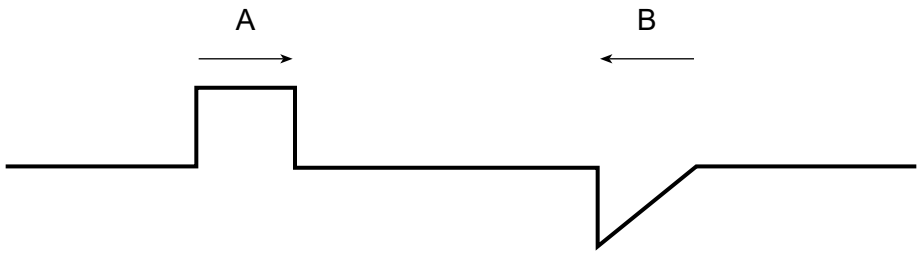
11 A 1-kilogram object rests on a table at a height of 1 meter from the floor. The work done by the table in supporting the object is

(1) 1 J
(2) 0 J
(3) 5 J
(4) 10 J

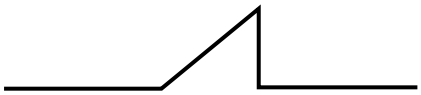
12 A length of nichrome wire of uniform cross-sectional area in a circuit is maintained at a constant temperature of 20°C. As the potential difference across the ends of the wire is increased, the resistance of the wire

(1) increases and the current through the wire decreases
(2) increases and the current through the wire remains the same
(3) remains the same and the current through the wire increases
(4) remains the same and the current through the wire remains the same

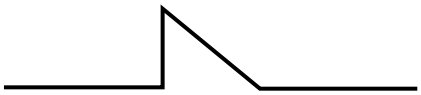
13 Two pulses, *A* and *B*, are traveling in opposite directions in a uniform medium, as shown in the diagram below.



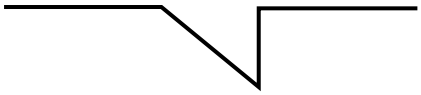
Which diagram best represents the superposition of the two pulses when the two pulses completely overlap?



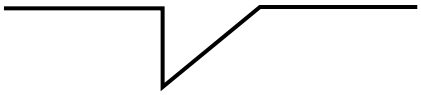
(1)



(3)



(2)



(4)

14 Radar waves transmitted from a weather station are sent toward a storm that is traveling toward the weather station. Compared to the transmitted waves, the reflected waves from the storm that are received by the station will have a

(1) lower frequency and longer wavelength
(2) lower frequency and shorter wavelength
(3) higher frequency and shorter wavelength
(4) higher frequency and longer wavelength

15 A 50.0-kilogram object is attracted to a planet with a gravitational force of 75.0 newtons. A 150.-kilogram object at the same location would be attracted to the planet with a gravitational force of

(1) 225 N
(2) 175 N
(3) 75.0 N
(4) 25.0 N

16 A student walks due north and then due east to arrive at a point 28 meters due northeast of their starting point. The perpendicular components of their displacement are

(1) 14 m north and 14 m east
(2) 20. m north and 20. m east
(3) 28 m north and 28 m east
(4) 40. m north and 40. m east

17 The driver of a car, traveling east at 14 meters per second, accelerates at 6.0 meters per second squared to a velocity of 24 meters per second east. What is the magnitude of the displacement of the car during this time?

(1) 16 m
(2) 32 m
(3) 48 m
(4) 63 m

18 A constant horizontal net force of 10. newtons acts on a 5.0-kilogram box on a lab table for 15 seconds. The magnitude of the change in momentum of the box is

(1) 30. kg•m/s
(2) 50. kg•m/s
(3) 150 kg•m/s
(4) 750 kg•m/s

19 A ball is thrown with the same initial speed at various angles above the horizontal. As the angle above the horizontal decreases, the horizontal component of the initial velocity

(1) increases and the vertical component of the initial velocity decreases
(2) increases and the vertical component of the initial velocity increases
(3) decreases and the vertical component of the initial velocity decreases
(4) decreases and the vertical component of the initial velocity remains the same

20 A projectile is fired from the ground with an initial speed of 1.0×10^2 meters per second. Which angle above the horizontal will result in the projectile having the greatest time of flight? [Neglect air resistance.]

(1) 0°
(2) 30.°
(3) 45°
(4) 90.°

21 Two identical arrows are fired vertically into the air. The first arrow has twice as much kinetic energy as the second arrow. Neglecting air friction, compared to the maximum height reached by the second arrow, the maximum height reached by the first arrow will be

(1) half as great
(2) the same
(3) twice as great
(4) four times as great

22 The inertia of a body is most closely related to its

(1) mass
(2) volume
(3) position
(4) speed

23 When a 1.0-kilogram baseball bat strikes a 0.15-kilogram baseball, the collision causes the ball to accelerate. Compared to the acceleration of the ball during the collision, the acceleration of the bat during the collision has

(1) the same magnitude and direction
(2) the same magnitude and the opposite direction
(3) a smaller magnitude and the same direction
(4) a smaller magnitude and the opposite direction

24 A 1.0-kilogram rock weighs 9.8 newtons on the surface of Earth. What is the mass of this rock on the surface of the Moon, where the magnitude of the gravitational field strength is 1.6 newtons per kilogram?

(1) 1.0 kg
(2) 0.16 kg
(3) 1.6 N
(4) 9.8 N

25 An object is moving at constant speed in a horizontal circle. Which statement describes the centripetal acceleration of the object?

(1) Its magnitude changes and it is directed toward the center of curvature.
(2) Its magnitude changes and it is directed tangent to the circle.
(3) Its magnitude is constant and it is directed toward the center of curvature.
(4) Its magnitude is constant and it is directed away from the center of curvature.

26 Identical rubber tires are sliding on various surfaces. On which surface would the tires experience the *least* frictional force?

(1) dry concrete
(2) wet concrete
(3) dry asphalt
(4) wet asphalt

27 The magnitude of the momentum of an electron traveling at 1.00×10^5 meters per second is

(1) 9.11×10^{-36} kg•m/s
(2) 1.67×10^{-32} kg•m/s
(3) 9.11×10^{-26} kg•m/s
(4) 1.67×10^{-22} kg•m/s

28 A 500.-newton student stands motionless on a level floor. What is the magnitude of the force that the student exerts on the floor?

(1) 0 N
(2) 9.81 N
(3) 500. N
(4) 4910 N

29 Which statement describes an object that is in equilibrium?

(1) There is only one force acting on the object.
(2) The object is uniformly accelerating.
(3) The object is moving in a circle.
(4) The net force acting on the object is zero.

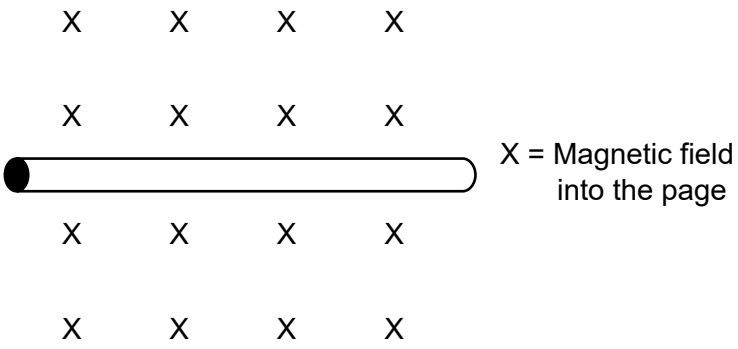
30 Which type of waves can *not* travel through a vacuum?

(1) ultraviolet waves
(2) FM radio waves
(3) sound waves
(4) microwaves

31 A 650.-newton student rides an elevator from the first floor to the third floor of a building. How much power is expended to lift the student a vertical distance of 6.00 meters in 13.0 seconds?

(1) 31.6 W
(2) 300. W
(3) 3.90×10^3 W
(4) 5.07×10^4 W

32 A wire segment is located within a uniform magnetic field that is directed into the page, as shown in the diagram below.



Which direction could the wire be moved to produce a potential difference across the ends of the wire segment?

(1) to the right
(2) to the left
(3) into the page
(4) toward the top of the page

33 For a complete description of the nature of electrons and photons, electrons and photons should be treated as

(1) particles, only
(2) waves, only
(3) both waves and particles
(4) each having no mass

34 When a photon collides with a stationary particle, the photon increases in wavelength and

(1) gains charge
(2) gains energy
(3) loses energy
(4) loses mass

35 Which statement describes the forces between subatomic particles?

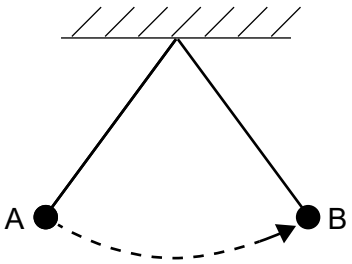
(1) Electrons are held in atoms by the electromagnetic force.
(2) Electrons are held in atoms by the strong force.
(3) Protons are held in the nucleus by the electromagnetic force.
(4) Protons are held in the nucleus by the gravitational force.

Part B–1

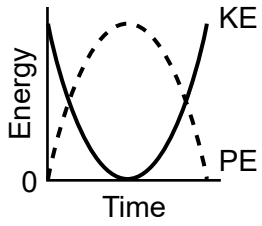
Answer all questions in this part.

Directions (36–50): For *each* statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2006 Edition Reference Tables for Physical Setting/Physics*. Record your answers on your separate answer sheet.

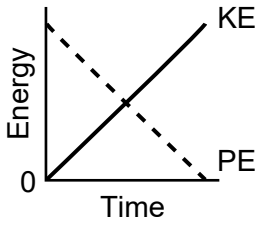
36 In the diagram below, a pendulum is released from Point *A* and allowed to swing freely to Point *B*, where it is stopped.



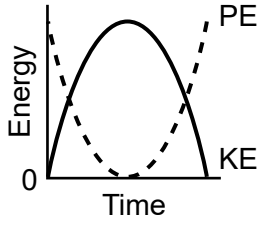
Which graph best represents the pendulum's kinetic energy (*KE*) and potential energy (*PE*) as a function of time as the pendulum swings from *A* to *B*?



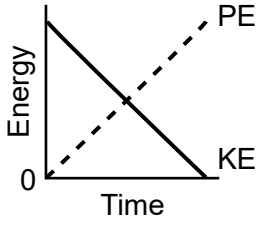
(1)



(3)



(2)

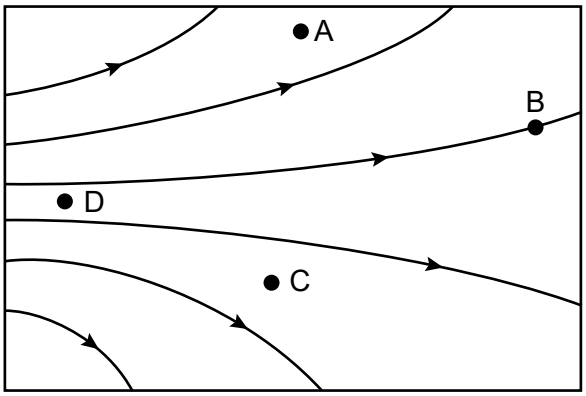


(4)

37 As a wooden crate slides down a wooden incline at constant speed, there is an increase in the crate's

(1) inertia
(2) momentum
(3) internal energy
(4) gravitational potential energy

38 The diagram below represents a magnetic field.



At which point is the magnetic field strength greatest?

(1) *A*
(2) *B*
(3) *C*
(4) *D*

39 In 1.5 minutes, 240 coulombs of charge pass through a conductor. What is the electric current in the conductor?

(1) 0.38 A
(2) 2.7 A
(3) 160 A
(4) 360 A

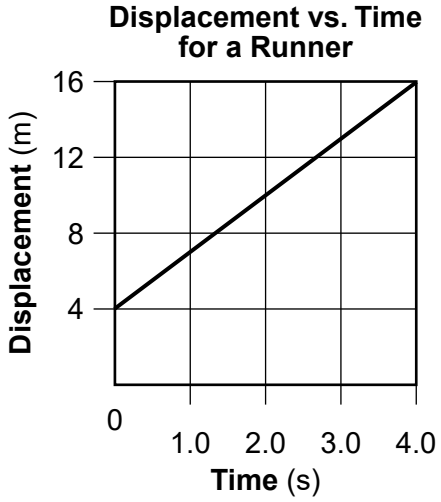
40 A potential difference of 5.0 volts is placed across a 220-ohm resistor. What is the total amount of energy this resistor dissipates in 30. seconds?

(1) 0.11 J
(2) 3.4 J
(3) 150 J
(4) 1100 J

41 A potential difference of 9.0×10^3 volts exists between Points *A* and *B* in an electric field. Compared to the total electrical energy gained by a 1.0-coulomb charge when moved from Point *A* to Point *B*, the total electrical energy gained by a 2.0-coulomb charge when moved from Point *A* to Point *B* is

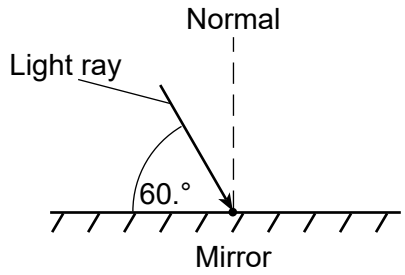
(1) half as great
(2) twice as great
(3) the same
(4) four times greater

42 The displacement-time graph below represents the motion of a runner along a straight track. What is the runner's speed during the 4.0-second interval shown?



(1) 0.33 m/s
(2) 0.75 m/s
(3) 3.0 m/s
(4) 4.0 m/s

43 A ray of light strikes a mirror at an angle of 60.° above the surface of a mirror, as shown in the diagram below.



The angle of reflection of the light ray is

(1) 30.°
(2) 60.°
(3) 90.°
(4) 120.°

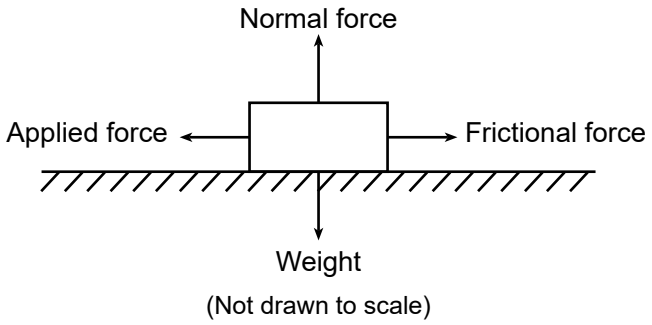
44 The thickness of a penny is approximately

(1) 1×10^{0} m
(2) 1×10^{-1} m
(3) 1×10^{-2} m
(4) 1×10^{-3} m

45 A 20-newton force and a 10-newton force are the only two forces acting concurrently on a body. As a result of these two forces, the body must be

(1) accelerating
(2) moving in the direction of the larger force
(3) stationary
(4) moving in the direction of the smaller force

46 The diagram below shows the forces acting on a box on a horizontal surface.



If the box is moving toward the left at a constant velocity, the magnitude of the net force acting on it is equal to

(1) zero
(2) the applied force
(3) the weight
(4) the normal force

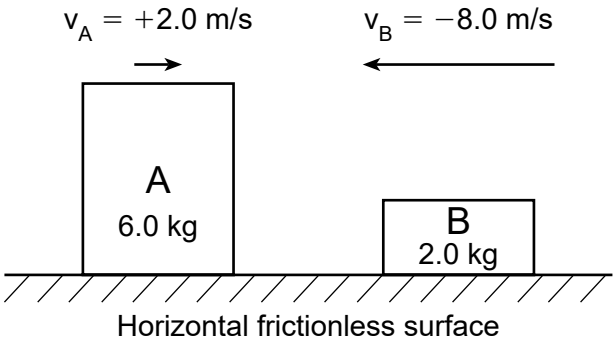
47 The charge on a single charm quark is equal to

(1) $+5.33 \times 10^{-20}$ C
(2) $+1.07 \times 10^{-19}$ C
(3) $+1.60 \times 10^{-19}$ C
(4) $+2.40 \times 10^{-19}$ C

48 A car with a mass of 1.2×10^3 kilograms is moving around a circular track at a uniform speed of 20. meters per second. The magnitude of the centripetal force on the car is 6.0×10^3 newtons. What is the radius of the track?

(1) 160 m
(2) 80. m
(3) 5.0 m
(4) 4.0 m

49 The diagram below shows two blocks, *A* and *B*, moving toward each other on a horizontal, frictionless surface. Block *A* has a mass of 6.0 kilograms and a velocity of +2.0 meters per second. Block *B* has a mass of 2.0 kilograms and a velocity of −8.0 meters per second.



After the blocks collide, they stick together and move off with a velocity of

(1) −0.5 m/s
(2) +0.5 m/s
(3) −5.0 m/s
(4) +5.0 m/s

50 What is the *minimum* amount of energy needed to ionize a mercury atom by removing an electron in energy level *g*?

(1) 2.48 eV
(2) 2.68 eV
(3) 7.90 eV
(4) 10.38 eV

Part B–2

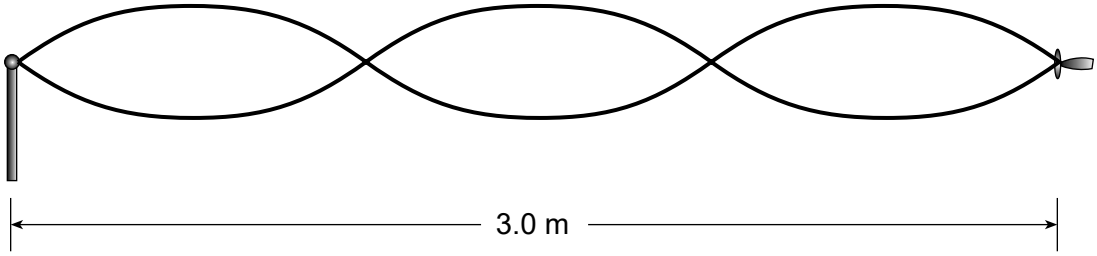
Answer all questions in this part.

Directions (51–65): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2006 Edition Reference Tables for Physical Setting/Physics*.

51 A metal wire has an electrical resistance of 0.325 ohm. If the wire has a length of 12.4 meters and a cross-sectional area of 1.13×10^{-6} meter squared, determine the resistivity of the wire. [1]

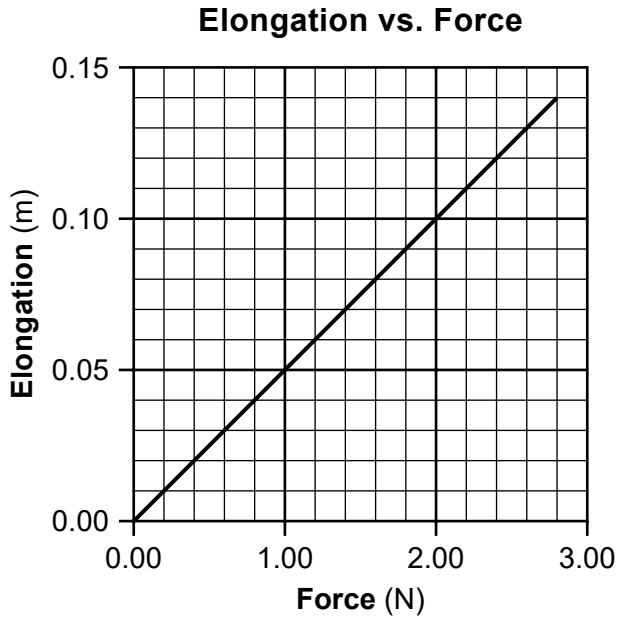
52 A cell phone emits electromagnetic waves with a frequency of 2.4 gigahertz. Determine the period of these waves in seconds. [1]

53 The diagram below shows a standing wave along a string. The distance between the ends of the string is 3.0 meters.



Determine the wavelength of the wave. [1]

Base your answers to questions 54 through 56 on the graph below, which represents the relationship between the elongation of a spring and the force applied to the spring.

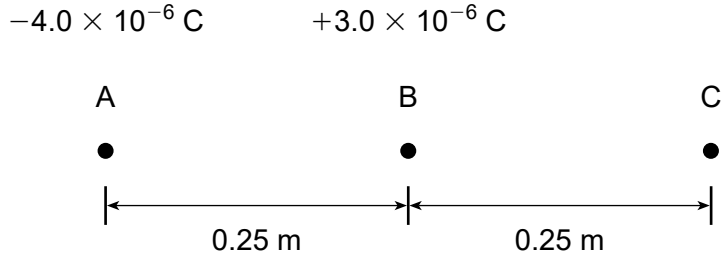


54 Determine the spring constant of this spring. [1]

55–56 Calculate the potential energy stored in the spring when the spring is stretched 0.120 meter. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 57 through 60 on the information and diagram below and on your knowledge of physics.

Three point charges, *A*, *B*, and *C*, are arranged in a straight line, as shown in the diagram. Charge *C* exerts a repulsive electrostatic force of 1.4 newtons on Charge *B*. Charge *A* is -4.0×10^{-6} coulomb and Charge *B* is $+3.0 \times 10^{-6}$ coulomb.



57–58 Calculate the magnitude of the electrostatic force that Charge *A* exerts on Charge *B*. [Show all work, including the equation and substitution with units.] [2]

59 Determine the magnitude of the resultant electrostatic force exerted on Charge *B* by Charge *A* and Charge *C*. [1]

60 Compare the magnitude of Charge *A* to the magnitude of Charge *C*. [1]

61–62 Calculate the total amount of energy, in joules, that would result from the complete conversion of 1.00×10^3 kilograms of the Sun's mass. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 63 through 65 on the information below and on your knowledge of physics.

A 1.89-electronvolt photon is emitted when an electron in a hydrogen atom drops from energy level $n = 3$ to energy level $n = 2$.

63 Determine the energy, in joules, of the emitted photon. [1]

64–65 Calculate the frequency of the emitted photon. [Show all work, including the equation and substitution with units.] [2]

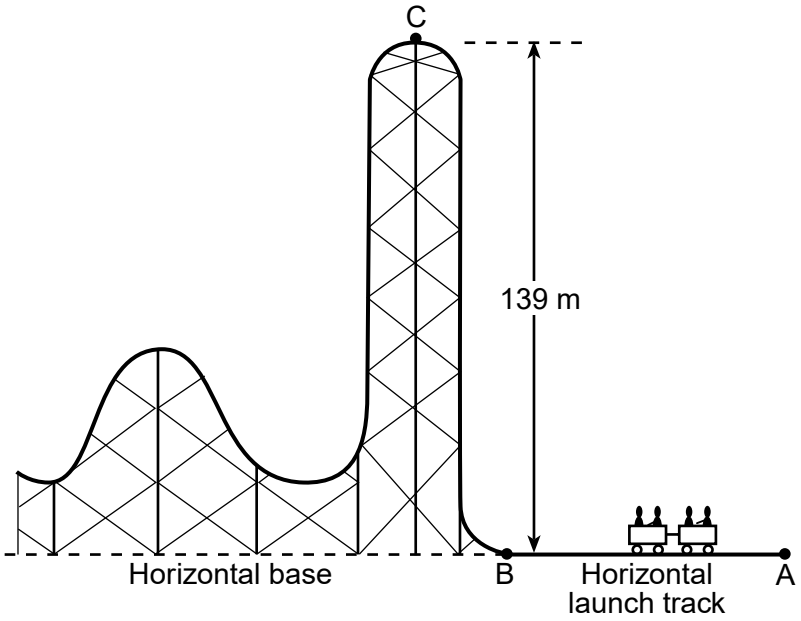
Part C

Answer all questions in this part.

Directions (66–85): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2006 Edition Reference Tables for Physical Setting/Physics*.

Base your answers to questions 66 through 71 on the information and diagram below and on your knowledge of physics.

One of the tallest and fastest roller coasters in the world is represented in the diagram below.



(Not drawn to scale)

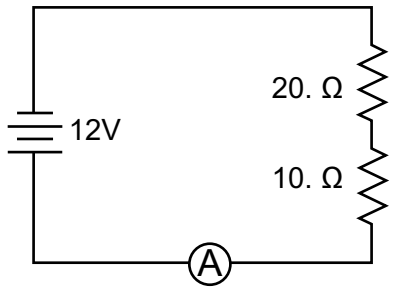
The roller coaster train begins the ride at Point *A* on a horizontal launch track. A hydraulic launch mechanism uniformly accelerates the train from rest to 57.2 meters per second at Point *B* in 3.5 seconds. At Point *B*, the end of the launch track, the train begins to coast up the main tower, reaching Point *C*, a vertical distance of 139 meters above the horizontal base.

66–67 Calculate the magnitude of the acceleration of the train on the launch track between Points *A* and *B*. [Show all work, including the equation and substitution with units.] [2]

68–69 Calculate the kinetic energy of a 70.0-kilogram passenger in the train at Point *B*. [Show all work, including the equation and substitution with units.] [2]

70–71 Calculate the gravitational potential energy gained by a 70.0-kilogram passenger during the ride from Point *B* to Point *C*. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 72 through 76 on the circuit diagram below and on your knowledge of physics.



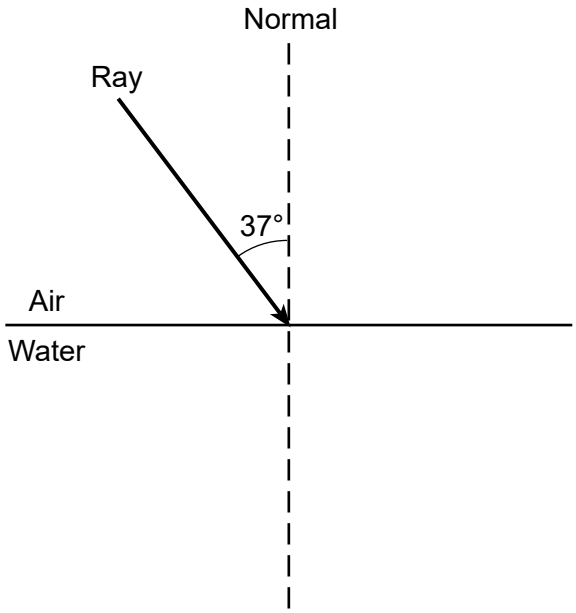
72 Determine the equivalent resistance of the circuit. [1]

73–74 Calculate the current in ammeter *A*. [Show all work, including the equation and substitution with units.] [2]

75–76 Calculate the power dissipated by the 10.-ohm resistor. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 77 through 81 on the information and diagram below and on your knowledge of physics.

A light ray ($f = 5.09 \times 10^{14}$ Hz) traveling in air is incident on the surface of water at 37°, as shown in the diagram below.



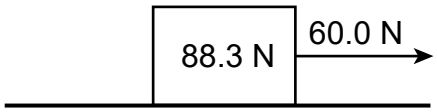
77–78 Calculate the angle of refraction of the light ray as it enters the water. [Show all work, including the equation and substitution with units.] [2]

79 On the diagram *in your answer booklet*, draw the refracted ray using a protractor and straightedge. [1]

80–81 Calculate the speed of the light ray in water. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 82 through 85 on the information and diagram below and on your knowledge of physics.

A 60.0-newton horizontal force is applied to a moving wooden box, weighing 88.3 newtons, across a horizontal wooden floor, as shown in the diagram.



82 Determine the magnitude of the normal force exerted by the floor on the box. [1]

83–84 Calculate the magnitude of the force of friction acting on the box. [Show all work, including the equation and substitution with units.] [2]

85 Determine the magnitude of the acceleration of the box. [1]

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