PRACTICE TESTS
for
PHYSICAL SETTING
REGENTS PHYSICS

STUDENTS

The purpose of this book is to give you an aid to review for the Physical Setting/ Physics Regents exam, or your school physics exam. You will find answers and explanations to the questions from four previous exams. Take your time in going through each exam. Try to answer each question on your own before checking the answer and the accompanying explanation. Concentrate on those that you have trouble with. Do not wait until the last minute to start your review. Start well before the Regents exam and do 20 to 25 questions at a sitting. By the time you finish the four exams in this booklet, you should have a good understanding of the wording and types of questions to expect on the Regents, or school physics exam.

Good luck on the exam.

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PHYSICS

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June 2018
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 in the space provided.**

1. Which combination correctly pairs a vector quantity with its corresponding unit?
(1) weight and kg (3) speed and m/s
(2) velocity and m/s (4) acceleration and m^2/s 1_____

2. A 12.0-kilogram cart is moving at a speed of 0.25 meter per second. After the speed of the cart is tripled, the inertia of the cart will be
(1) unchanged (3) three times greater
(2) one-third as great (4) nine times greater 2_____

3. While taking off from an aircraft carrier, a jet starting from rest accelerates uniformly to a final speed of 40. meters per second on a runway that is 70. meters long. What is the magnitude of the acceleration of the jet?
(1) 0.29 m/s^2 (2) 0.57 m/s^2 (3) 1.8 m/s^2 (4) 11 m/s^2 3_____

4. A 6.0-kilogram cart initially traveling at 4.0 meters per second east accelerates uniformly at 0.50 meter per second squared east for 3.0 seconds. What is the speed of the cart at the end of this 3.0 second interval?
(1) 1.5 m/s (2) 5.5 m/s (3) 3.0 m/s (4) 7.0 m/s 4_____

5. A soccer ball is kicked into the air from level ground with an initial speed of 20. meters per second and returns to ground level. At which angle above the horizontal should the ball be kicked in order for the ball to travel the greatest total horizontal distance? [Neglect friction.]
(1) 15° (2) 30.° (3) 45° (4) 75° 5_____

6. Starting from rest, a car travels 18 meters as it accelerates uniformly for 3.0 seconds. What is the magnitude of the car's acceleration?
(1) 6.0 m/s^2 (2) 2.0 m/s^2 (3) 3.0 m/s^2 (4) 4.0 m/s^2 6_____

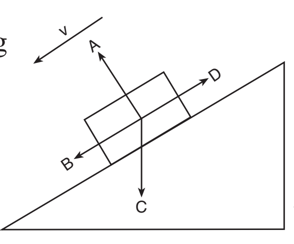
7. A ball is rolling horizontally at 3.00 meters per second as it leaves the edge of a tabletop 0.750 meter above the floor. The ball lands on the floor 0.391 second after leaving the tabletop. What is the magnitude of the ball's acceleration 0.200 second after it leaves the tabletop? [Neglect friction.]
(1) 1.96 m/s^2 (2) 7.65 m/s^2 (3) 9.81 m/s^2 (4) 15.3 m/s^2 7_____

8. A projectile with mass *m* is fired with initial horizontal velocity v_x from height *h* above level ground. Which change would have resulted in a greater time of flight for the projectile? [Neglect friction.]
(1) decreasing the mass to *m*/2
(2) decreasing the height to *h*/2
(3) increasing the initial horizontal velocity to $2v_x$
(4) increasing the height to 2*h* 8_____

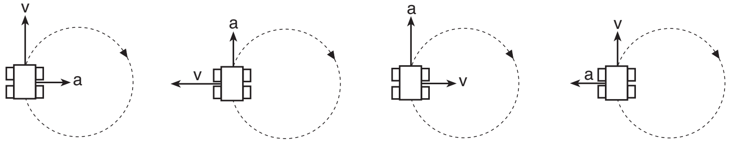
9. A golf club hits a stationary 0.050-kilogram golf ball with an average force of 5.0×10^3 newtons, accelerating the ball to a speed of 44 meters per second. What is the magnitude of the impulse imparted to the ball by the golf club?
(1) 2.2 N•s (3) 1.1×10^4 N•s
(2) 880 N•s (4) 2.2×10^5 N•s 9_____

10. A tennis player's racket applies an average force of 200. newtons to a tennis ball for 0.025 second. The average force exerted on the racket by the tennis ball is
(1) 0.025 N (2) 5.0 N (3) 200. N (4) 80.0 N 10____

11. The diagram represents a box sliding down an incline at constant velocity. Which arrow represents the direction of the frictional force acting on the box?
(1) *A* (3) *C*
(2) *B* (4) *D* 11____

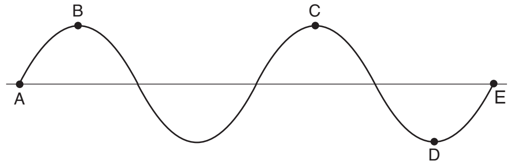


12. Which diagram represents the directions of the velocity, *v*, and acceleration, *a*, of a toy car as it moves in a clockwise, horizontal, circular path at a constant speed?



(1) (2) (3) (4) 12____

35. Which points on the wave diagram are 90° out of phase with each other?



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

35____

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 the space provided.**

36. The height of an individual step on a staircase is closest to
(1) 2.0×10^{-2} m (3) 2.0×10^{0} m
(2) 2.0×10^{-1} m (4) 2.0×10^{1} m 36____

37. What is the magnitude of the electrostatic force exerted on an electron by another electron when they are 0.10 meter apart?
(1) 2.6×10^{-36} N (3) 2.3×10^{-26} N
(2) 2.3×10^{-27} N (4) 1.4×10^{-8} N 37____

38. After a 65-newton weight has fallen freely from rest a vertical distance of 5.3 meters, the kinetic energy of the weight is
(1) 12 J (2) 340 J (3) 910 J (4) 1800 J 38____

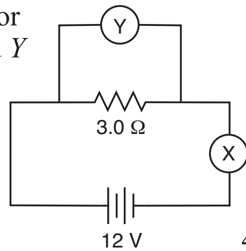
39. A 0.500-kilogram cart traveling to the right on a horizontal, frictionless surface at 2.20 meters per second collides head on with a 0.800-kilogram cart moving to the left at 1.10 meters per second. What is the magnitude of the total momentum of the two-cart system after the collision?
(1) 0.22 kg•m/s (3) 1.98 kg•m/s
(2) 0.39 kg•m/s (4) 4.29 kg•m/s 39____

40. An object weighing 2.0 newtons is pushed across a horizontal, frictionless surface by a horizontal force of 4.0 newtons. The magnitude of the net force acting on the object is
(1) 0.0 N (2) 2.0 N (3) 8.0 N (4) 4.0 N 40____

41. The ratio of the wavelength of AM radio waves traveling in a vacuum to the wavelength of FM radio waves traveling in a vacuum is approximately
(1) 1 to 1 (2) 2 to 1 (3) 10^{2} to 1 (4) 10^{8} to 1 41____

42. A charm quark has a charge of approximately
(1) 5.33×10^{-20} C (3) 1.60×10^{-19} C
(2) 1.07×10^{-19} C (4) 2.40×10^{-19} C 42____

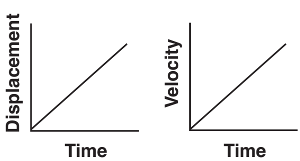
43. The diagram represents a 3.0-ohm resistor connected to a 12-volt battery. Meters *X* and *Y* are correctly connected in the circuit. What are the readings on the meters?



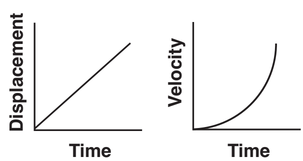
(1) *X* = 12 V and *Y* = 0.25 A
(2) *X* = 12 V and *Y* = 4.0 A
(3) *X* = 0.25 A and *Y* = 12 V
(4) *X* = 4.0 A and *Y* = 12 V 43____

44. A toy airplane, flying in a horizontal, circular path, completes 10. complete circles in 30. seconds. If the radius of the plane's circular path is 4.0 meters, the average speed of the airplane is
(1) 0.13 m/s (2) 0.84 m/s (3) 1.3 m/s (4) 8.4 m/s 44____

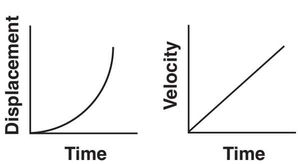
45. Which pair of graphs represents the vertical motion of an object falling freely from rest?



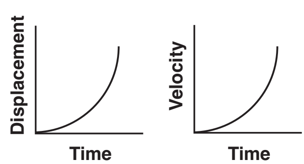
(1)



(3)



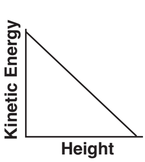
(2)



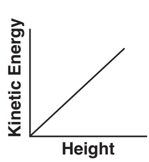
(4)

45____

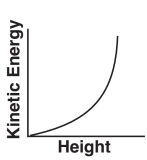
46. An object is thrown straight upward. Which graph best represents the relationship between the object's kinetic energy and the height of the object above its release point? [Neglect friction.]



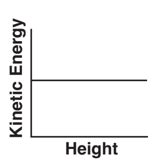
(1)



(2)



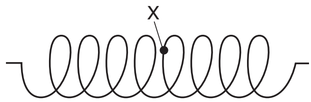
(3)



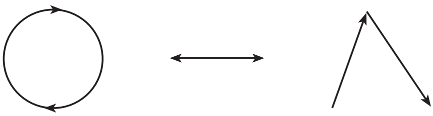
(4)

46____

47. In the diagram, *X* represents a particle in a spring.



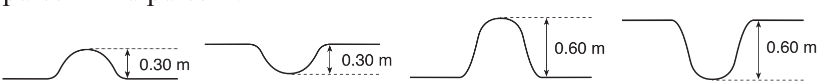
Which diagram represents the motion of particle *X* as a longitudinal wave passes through the spring toward the right?



(1) (2) (3) (4) 47____

48. As represented in the diagram below, two wave pulses, *X* and *Y*, are traveling toward each other in a rope. Both wave pulses have an amplitude of 0.30 m.

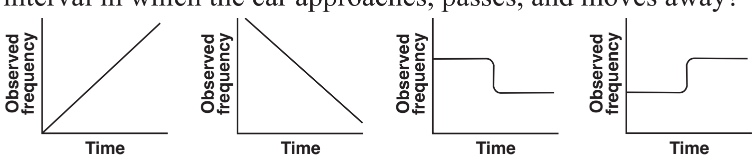
Which diagram shows the pulse produced due to the superposition of pulse *X* and pulse *Y*?



(1) (2) (3) (4)

48____

49. The horn of a car produces a sound wave of constant frequency. The car, traveling at constant speed, approaches, passes, and then moves away from a stationary observer. Which graph best represents the frequency of this sound wave detected by the observer during the time interval in which the car approaches, passes, and moves away?



(1) (2) (3) (4) 49____

50. A combination of two identical resistors connected in series has an equivalent resistance of 10. ohms. What is the equivalent resistance of the combination of these same two resistors when connected in parallel?

(1) 2.5 Ω (2) 5.0 Ω (3) 10. Ω (4) 20. Ω

50____

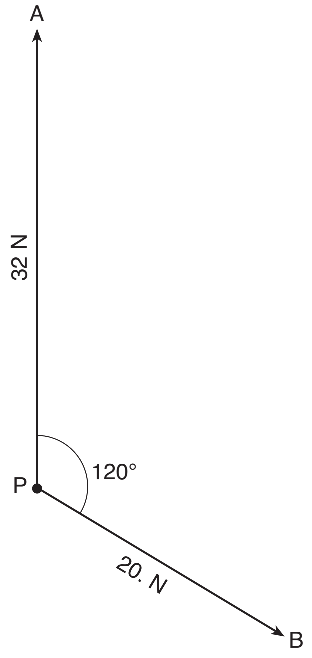
Part B–2

Answer all questions in this part.

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

Base your answers to questions 51 through 53 on the information below and on your knowledge of physics.

The scaled diagram below represents two forces acting concurrently at point *P*. The magnitude of force *A* is 32 newtons and the magnitude of force *B* is 20. newtons. The angle
between the directions of force *A* and force *B* is 120º.



51. Determine the linear scale used in the diagram. [1]
1.0 cm = ____________ N

52. On the diagram above, use a protractor and a ruler to construct a scaled vector to represent the resultant of forces *A* and *B*. Label the vector *R*. [1]

53. Determine the magnitude of the resultant force. [1] ____________ N

Part C

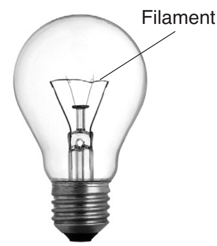
Answer all questions in this part.

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

Base your answers to questions 66 through 70 on the information and diagram below and on your knowledge of physics.

An incandescent lightbulb uses a length of thin tungsten wire as the filament (the part of the operating bulb that produces light).

Incandescent Lightbulb



One particular lightbulb has a 0.22-meter length of the tungsten wire used as its filament. This tungsten wire filament has a resistance of 19 ohms at a temperature of 20ºC. The tungsten wire filament has a resistance of 240 ohms when this bulb is operated at a potential difference of 120 volts.

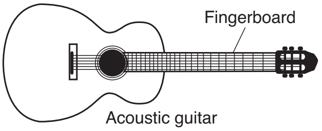
66–67. Calculate the cross-sectional area of this tungsten wire filament. [Show all work, including the equation and substitution with units.] [2]

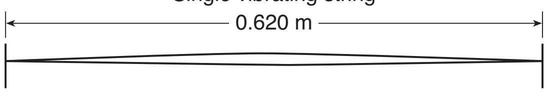
68. Explain why the resistance of the tungsten wire filament increases when the bulb is being operated compared to the resistance of the filament at 20ºC. [1] ______________________________

69–70. Calculate the power of this lightbulb when it is being operated at a potential difference of 120 volts. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 81 through 85 on the information and diagram below and on your knowledge of physics.

A musician plucks a 0.620-meter-long string on an acoustic guitar, as represented in the diagram below.





The plucked string vibrates, producing a musical note called "G." The waves traveling along the vibrating string produce a standing wave with a frequency of 196 hertz.

81. On the diagram of the standing wave above, label *one* node with the letter **N** and *one* antinode with the letter **A**. [1]

82. Determine the wavelength of the standing wave on the 0.620-meter-long vibrating string. [1] ________________ m

83–84. Calculate the speed of the wave traveling on the vibrating string. [Show all work, including the equation and substitution with units.] [2]

85. Describe what happens to the frequency when the musician shortens the vibrating portion of the string by pinching the string against the fingerboard while the string continues to vibrate. [1]

June 2018
Part A

1. 2 A vector is a quantity possessing both magnitude (size) and direction. Of the choices given, weight, velocity and acceleration are vectors. Speed is a scalar quantity, possessing magnitude only. Of the vectors, only velocity is paired with the correct unit, m/s. The unit of weight is the newton (N) and the unit of acceleration is m/s^2.

2. 1 Inertia is measured quantitatively by the mass of an object. It is independent of the speed of the object. The mass of the cart is constant and its inertia remains constant.

3. 4 Under Mechanics, find the equation $v_f^2 = v_i^2 + 2ad$. Since the object starts from rest, $v_i^2 = 0$. Substitution gives $(40.\ m/s)^2 = 2a(70.\ m)$. Solving, $a = 11\ m/s^2$.

4. 2 Under Mechanics, find the equation $v_f = v_i + at$. Substitution gives $v_f = 4.0\ m/s + (0.50\ m/s^2)(3.0\ s)$. Solving, $v_f = 5.5\ m/s$. The final speed is independent of the mass of the cart.

5. 3 A projectile travels the greatest horizontal distance when projected into the air at an angle of 45°. It will reach its maximum height when projected at an angle of 90° into the air.

6. 4 Under Mechanics, find the equation $d = v_it + \frac{1}{2}at^2$. Since the object starts from rest, $v_it = 0$. Substitution gives $18\ m = \frac{1}{2}a(3.0\ s)^2$. Solving, $a = 4.0\ m/s^2$.

7. 3 The only acceleration the ball is undergoing is that due to gravity (g). The value of g is found on the List of Physical Constants.

8. 4 The time of flight of the projectile is independent of the mass of the object. The horizontal velocity determines only the horizontal distance the projectile travels. The time of flight will increase only if the vertical distance or height of projection is increased.

9. 1 Under Mechanics, find the equation $J = F_{net}t = \Delta p$. The change in momentum (Δp) may be expressed as $m\Delta v$ where $\Delta v = v_f - v_i$. Substitution gives $J = (0.050\ kg)(44\ m/s - 0)$. Solving, $J = 2.2$ N•s.

10. 3 This involves an application of Newton's Third Law which states that for every action, there is an equal and opposite reaction. If the racket exerts a force of 200. N on the tennis ball, the tennis ball exerts a force of 200. N back on the racket.

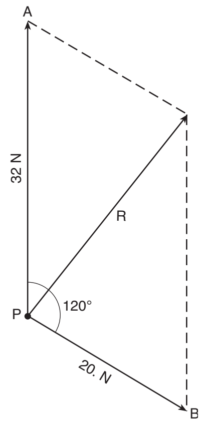
11. 4 The force of friction on an object acts in the direction that is opposite to that of the motion of the object. Since the object is sliding down the incline, the force of friction is directed up the incline.

Part B-2

51. 1 cm = 4.0 N ± 0.2 N

Explanation: Measure the length of lines *AP* and *BP* in cm. Divide the magnitudes of the forces represented by each line by the lengths to determine the scale in N/cm.

52.



Resultant 7.0 cm ± 0.2 cm long at an angle of 38° ± 2° clockwise from force *A*.

Explanation: Complete a parallelogram using the 2 forces as two sides of the parallelogram. Draw the diagonal of the parallelogram starting at the point of origin of the 32 N and 20. N forces. This diagonal represents the resultant of the two forces. Label the diagonal *R*.

53. *R* = 28 N ± 2 N Explanation: Measure the length of the diagonal (*R*) and use the scale determined in question 51. The length of *R* is 7.0 cm. The magnitude of *R* is (4.0 N/cm)(7.0 cm) = 28 N.

54. $W = Fd$
$W = (25\text{ N})(6.0\text{ m})$

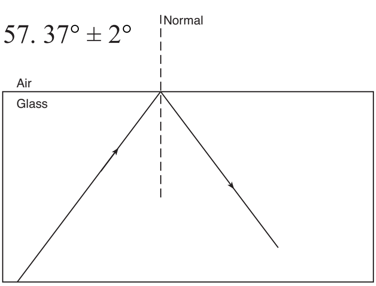
Explanation: Under Mechanics, find the equation $W = Fd$. The force exerted by the student is 25 N and the distance the force moves the box is 6.0 m. Substitute the values, with units, into the equation.

55. 150 *J* *or* 150 N•m Explanation: Solve the equation in question 54.

56. The work would increase.

Explanation: An increase in the coefficient of friction between the box and the incline will increase the force of friction between the two surfaces. This increases the force that must be exerted on the box to push it up the incline, increasing the work that is done.

57. 37° ± 2°



Explanation: The angle of reflection (angle between the reflected ray and the normal at the point of reflection) equals the angle of incidence (angle between the incident ray and the normal at the point of incidence). As measured with a protractor, the angle of incidence is 37°. Therefore, the angle of reflection must be. 37°. Draw the reflected ray at a 37° angle to the normal.

PHYSICAL SETTING
PHYSICS — REFERENCE TABLE
2006 EDITION

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List of Physical Constants

Name	Symbol	Value
Universal gravitational constant	G	6.67×10^{-11} N•m²/kg²
Acceleration due to gravity	g	9.81 m/s²
Speed of light in a vacuum	c	3.00×10^{8} m/s
Speed of sound in air at STP		3.31×10^{2} m/s
Mass of Earth		5.98×10^{24} kg
Mass of the Moon		7.35×10^{22} kg
Mean radius of Earth		6.37×10^{6} m
Mean radius of the Moon		1.74×10^{6} m
Mean distance—Earth to the Moon		3.84×10^{8} m
Mean distance—Earth to the Sun		1.50×10^{11} m
Electrostatic constant	k	8.99×10^{9} N•m²/C²
1 elementary charge	e	1.60×10^{-19} C
1 coulomb (C)		6.25×10^{18} elementary charges
1 electronvolt (eV)		1.60×10^{-19} J
Planck's constant	h	6.63×10^{-34} J•s
1 universal mass unit (u)		9.31×10^{2} MeV
Rest mass of the electron	m_e	9.11×10^{-31} kg
Rest mass of the proton	m_p	1.67×10^{-27} kg
Rest mass of the neutron	m_n	1.67×10^{-27} kg