The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Friday, June 20, 2014 — 1:15 to 4:15 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 scalar?

(1) mass
(2) force
(3) momentum
(4) acceleration

2 What is the final speed of an object that starts from rest and accelerates uniformly at 4.0 meters per second^2 over a distance of 8.0 meters?

(1) 8.0 m/s
(2) 16 m/s
(3) 32 m/s
(4) 64 m/s

3 The components of a 15-meters-per-second velocity at an angle of 60.° above the horizontal are

(1) 7.5 m/s vertical and 13 m/s horizontal
(2) 13 m/s vertical and 7.5 m/s horizontal
(3) 6.0 m/s vertical and 9.0 m/s horizontal
(4) 9.0 m/s vertical and 6.0 m/s horizontal

4 What is the time required for an object starting from rest to fall freely 500. meters near Earth's surface?

(1) 51.0 s
(2) 25.5 s
(3) 10.1 s
(4) 7.14 s

5 A baseball bat exerts a force of magnitude F on a ball. If the mass of the bat is three times the mass of the ball, the magnitude of the force of the ball on the bat is

(1) F
(2) $2F$
(3) $3F$
(4) $F/3$

6 A 2.0-kilogram mass is located 3.0 meters above the surface of Earth. What is the magnitude of Earth's gravitational field strength at this location?

(1) 4.9 N/kg
(2) 2.0 N/kg
(3) 9.8 N/kg
(4) 20. N/kg

7 A truck, initially traveling at a speed of 22 meters per second, increases speed at a constant rate of 2.4 meters per second^2 for 3.2 seconds. What is the total distance traveled by the truck during this 3.2-second time interval?

(1) 12 m
(2) 58 m
(3) 70. m
(4) 83 m

8 A 750-newton person stands in an elevator that is accelerating downward. The upward force of the elevator floor on the person must be

(1) equal to 0 N
(2) less than 750 N
(3) equal to 750 N
(4) greater than 750 N

9 A 3.0-kilogram object is acted upon by an impulse having a magnitude of 15 newton•seconds. What is the magnitude of the object's change in momentum due to this impulse?

(1) 5.0 kg•m/s
(2) 15 kg•m/s
(3) 3.0 kg•m/s
(4) 45 kg•m/s

10 An air bag is used to safely decrease the momentum of a driver in a car accident. The air bag reduces the magnitude of the force acting on the driver by

(1) increasing the length of time the force acts on the driver
(2) decreasing the distance over which the force acts on the driver
(3) increasing the rate of acceleration of the driver
(4) decreasing the mass of the driver

11 An electron moving at constant speed produces

(1) a magnetic field, only
(2) an electric field, only
(3) both a magnetic and an electric field
(4) neither a magnetic nor an electric field

12 A beam of electrons passes through an electric field where the magnitude of the electric field strength is 3.00×10^3 newtons per coulomb. What is the magnitude of the electrostatic force exerted by the electric field on each electron in the beam?

(1) 5.33×10^{-23} N
(2) 4.80×10^{-16} N
(3) 3.00×10^3 N
(4) 1.88×10^{22} N

13 How much work is required to move 3.0 coulombs of electric charge a distance of 0.010 meter through a potential difference of 9.0 volts?

(1) 2.7×10^3 J
(2) 27 J
(3) 3.0 J
(4) 3.0×10^{-2} J

14 What is the resistance of a 20.0-meter-long tungsten rod with a cross-sectional area of 1.00×10^{-4} meter^2 at 20°C?

(1) $2.80 \times 10^{-5}\ \Omega$
(2) $1.12 \times 10^{-2}\ \Omega$
(3) 89.3 Ω
(4) 112 Ω

15 Two pieces of flint rock produce a visible spark when they are struck together. During this process, mechanical energy is converted into

(1) nuclear energy and electromagnetic energy
(2) internal energy and nuclear energy
(3) electromagnetic energy and internal energy
(4) elastic potential energy and nuclear energy

16 A 15-kilogram cart is at rest on a horizontal surface. A 5-kilogram box is placed in the cart. Compared to the mass and inertia of the cart, the cart-box system has

(1) more mass and more inertia
(2) more mass and the same inertia
(3) the same mass and more inertia
(4) less mass and more inertia

17 Transverse waves are to radio waves as longitudinal waves are to

(1) light waves
(2) microwaves
(3) ultraviolet waves
(4) sound waves

18 As a monochromatic light ray passes from air into water, two characteristics of the ray that will *not* change are

(1) wavelength and period
(2) frequency and period
(3) wavelength and speed
(4) frequency and speed

19 When a mass is placed on a spring with a spring constant of 60.0 newtons per meter, the spring is compressed 0.500 meter. How much energy is stored in the spring?

(1) 60.0 J
(2) 30.0 J
(3) 15.0 J
(4) 7.50 J

20 A boy pushes his sister on a swing. What is the frequency of oscillation of his sister on the swing if the boy counts 90. complete swings in 300. seconds?

(1) 0.30 Hz
(2) 2.0 Hz
(3) 1.5 Hz
(4) 18 Hz

21 What is the period of a sound wave having a frequency of 340. hertz?

(1) 3.40×10^2 s
(2) 1.02×10^0 s
(3) 9.73×10^{-1} s
(4) 2.94×10^{-3} s

22 An MP3 player draws a current of 0.120 ampere from a 3.00-volt battery. What is the total charge that passes through the player in 900. seconds?

(1) 324 C
(2) 108 C
(3) 5.40 C
(4) 1.80 C

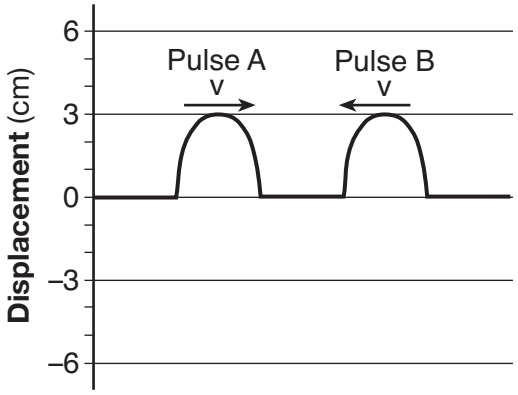
23 A beam of light has a wavelength of 4.5×10^{-7} meter in a vacuum. The frequency of this light is

(1) 1.5×10^{-15} Hz
(2) 4.5×10^{-7} Hz
(3) 1.4×10^2 Hz
(4) 6.7×10^{14} Hz

24 When x-ray radiation and infrared radiation are traveling in a vacuum, they have the same

(1) speed
(2) frequency
(3) wavelength
(4) energy per photon

25 The diagram below represents two identical pulses approaching each other in a uniform medium.



As the pulses meet and are superposed, the maximum displacement of the medium is

(1) –6 cm
(2) 0 cm
(3) 3 cm
(4) 6 cm

26 As a car approaches a pedestrian crossing the road, the driver blows the horn. Compared to the sound wave emitted by the horn, the sound wave detected by the pedestrian has a

(1) higher frequency and a lower pitch
(2) higher frequency and a higher pitch
(3) lower frequency and a higher pitch
(4) lower frequency and a lower pitch

27 When air is blown across the top of an open water bottle, air molecules in the bottle vibrate at a particular frequency and sound is produced. This phenomenon is called

(1) diffraction
(2) refraction
(3) resonance
(4) the Doppler effect

28 An antibaryon composed of two antiup quarks and one antidown quark would have a charge of

(1) +1e
(2) –1e
(3) 0e
(4) –3e

29 Which force is responsible for producing a stable nucleus by opposing the electrostatic force of repulsion between protons?

(1) strong
(2) weak
(3) frictional
(4) gravitational

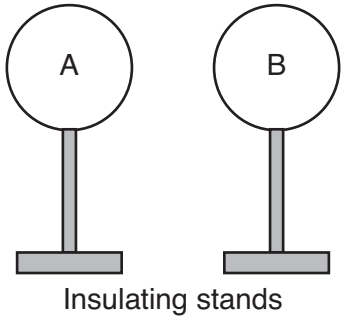
30 What is the total energy released when 9.11×10^{-31} kilogram of mass is converted into energy?

(1) 2.73×10^{-22} J
(2) 8.20×10^{-14} J
(3) 9.11×10^{-31} J
(4) 1.01×10^{-47} J

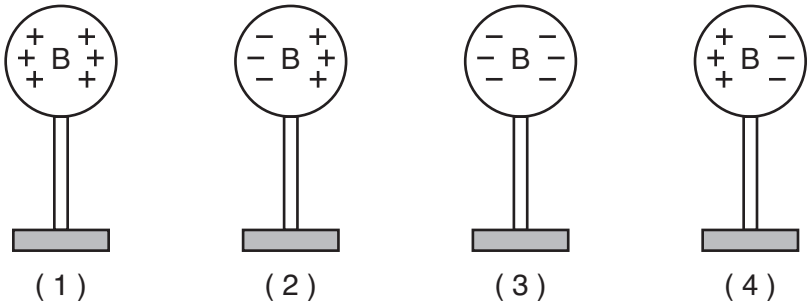
31 A shopping cart slows as it moves along a level floor. Which statement describes the energies of the cart?

(1) The kinetic energy increases and the gravitational potential energy remains the same.
(2) The kinetic energy increases and the gravitational potential energy decreases.
(3) The kinetic energy decreases and the gravitational potential energy remains the same.
(4) The kinetic energy decreases and the gravitational potential energy increases.

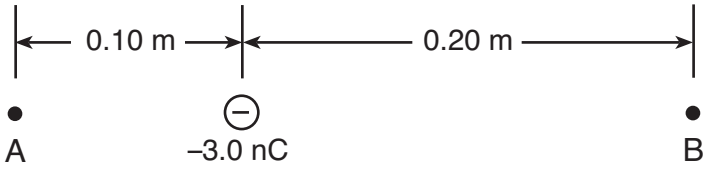
32 Two identically-sized metal spheres, *A* and *B*, are on insulating stands, as shown in the diagram below. Sphere *A* possesses an excess of 6.3×10^{10} electrons and sphere *B* is neutral.



Which diagram best represents the charge distribution on sphere *B*?



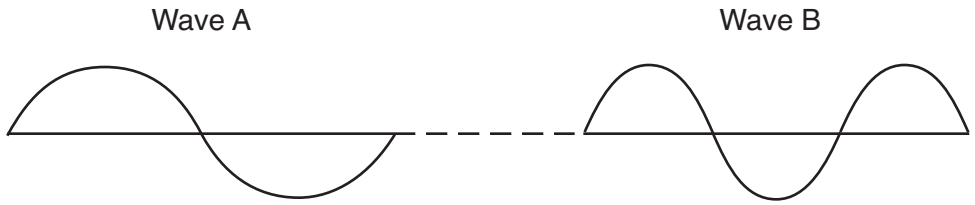
33 Two points, *A* and *B*, are located within the electric field produced by a –3.0 nanocoulomb charge. Point *A* is 0.10 meter to the left of the charge and point *B* is 0.20 meter to the right of the charge, as shown in the diagram below.



Compared to the magnitude of the electric field strength at point *A*, the magnitude of the electric field strength at point *B* is

(1) half as great
(2) twice as great
(3) one-fourth as great
(4) four times as great

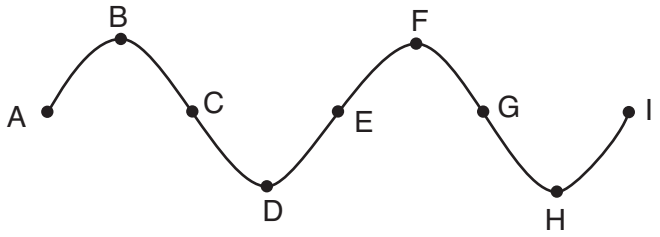
34 The diagram below represents two waves, *A* and *B*, traveling through the same uniform medium.



Which characteristic is the same for both waves?

(1) amplitude
(2) frequency
(3) period
(4) wavelength

35 The diagram below shows a periodic wave.



Which two points on the wave are 180.° out of phase?

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

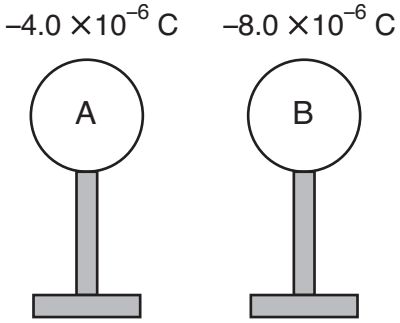
Part B–1

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 The height of a 30-story building is approximately
(1) 10^0 m (3) 10^2 m
(2) 10^1 m (4) 10^3 m

37 Two identically-sized metal spheres on insulating stands are positioned as shown below. The charge on sphere *A* is -4.0×10^{-6} coulomb and the charge on sphere *B* is -8.0×10^{-6} coulomb.



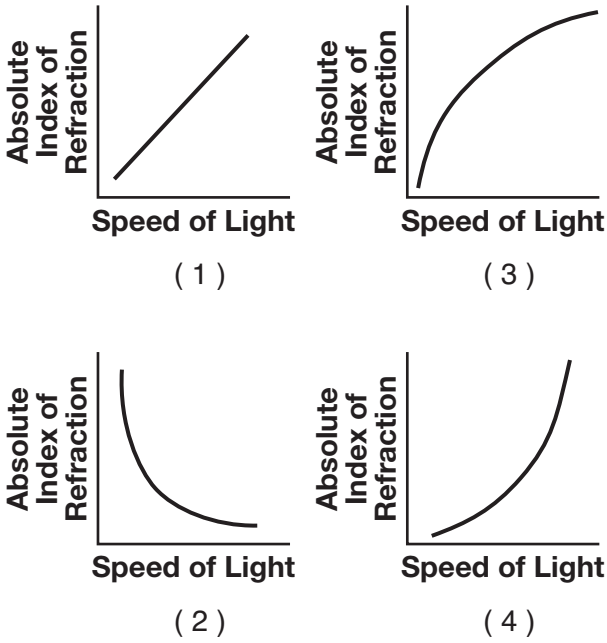
The two spheres are touched together and then separated. The total number of excess electrons on sphere *A* after the separation is
(1) 2.5×10^{13} (3) 5.0×10^{13}
(2) 3.8×10^{13} (4) 7.5×10^{13}

38 A 1.0×10^3-kilogram car travels at a constant speed of 20. meters per second around a horizontal circular track. The diameter of the track is 1.0×10^2 meters. The magnitude of the car's centripetal acceleration is
(1) 0.20 m/s^2 (3) 8.0 m/s^2
(2) 2.0 m/s^2 (4) 4.0 m/s^2

39 Which combination of units can be used to express electrical energy?
(1) $\frac{\text{volt}}{\text{coulomb}}$
(2) $\frac{\text{coulomb}}{\text{volt}}$
(3) volt•coulomb
(4) volt•coulomb•second

40 The total amount of electrical energy used by a 315-watt television during 30.0 minutes of operation is
(1) 5.67×10^5 J (3) 1.05×10^1 J
(2) 9.45×10^3 J (4) 1.75×10^{-1} J

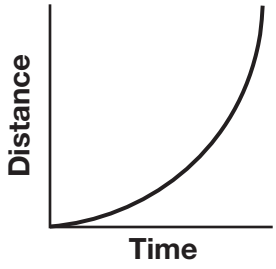
41 Which graph best represents the relationship between the absolute index of refraction and the speed of light ($f = 5.09 \times 10^{14}$ Hz) in various media?



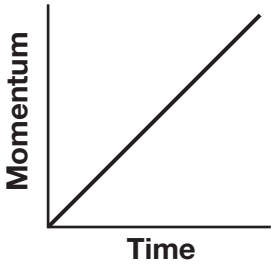
42 A 25-gram paper cup falls from rest off the edge of a tabletop 0.90 meter above the floor. If the cup has 0.20 joule of kinetic energy when it hits the floor, what is the total amount of energy converted into internal (thermal) energy during the cup's fall?
(1) 0.02 J (3) 2.2 J
(2) 0.22 J (4) 220 J

43 Which electron transition between the energy levels of hydrogen causes the emission of a photon of visible light?
(1) $n = 6$ to $n = 5$ (3) $n = 5$ to $n = 2$
(2) $n = 5$ to $n = 6$ (4) $n = 2$ to $n = 5$

44 Which graph best represents an object in equilibrium moving in a straight line?



(1)



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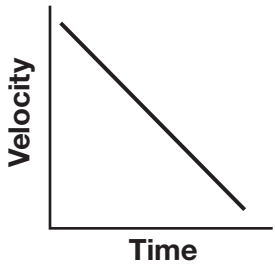
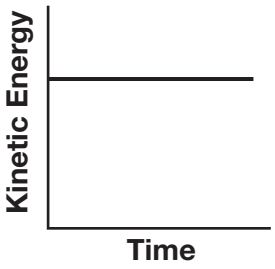
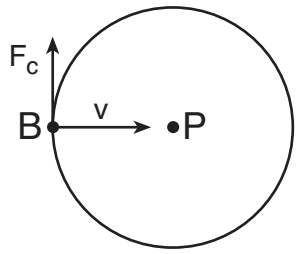


(2)

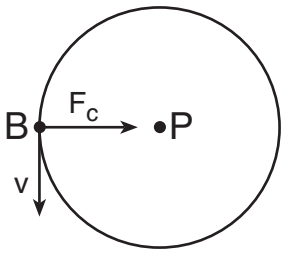


(4)

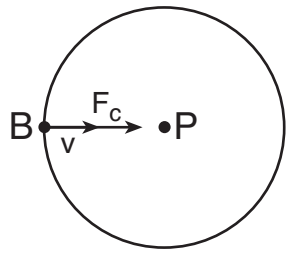
45 A body, *B*, is moving at constant speed in a horizontal circular path around point *P*. Which diagram shows the direction of the velocity (v) and the direction of the centripetal force (F_c) acting on the body?



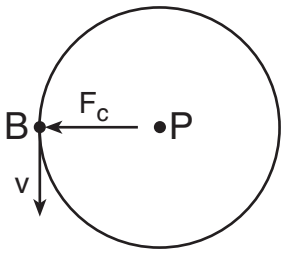
(1)



(3)

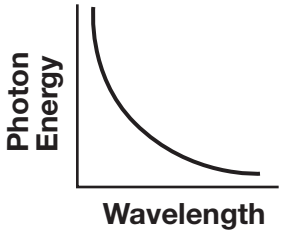


(2)

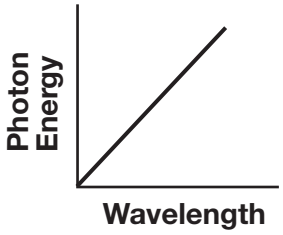


(4)

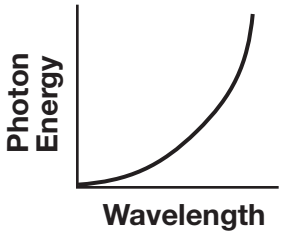
46 Which graph best represents the relationship between photon energy and photon wavelength?



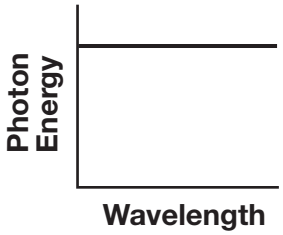
(1)



(3)

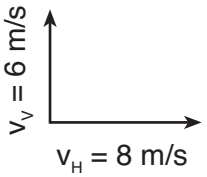


(2)

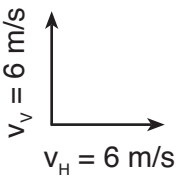


(4)

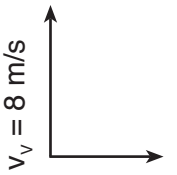
47 Which combination of initial horizontal velocity, (v_H) and initial vertical velocity, (v_v) results in the greatest horizontal range for a projectile over level ground? [Neglect friction.]



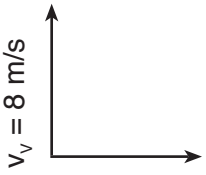
(1)



(3)

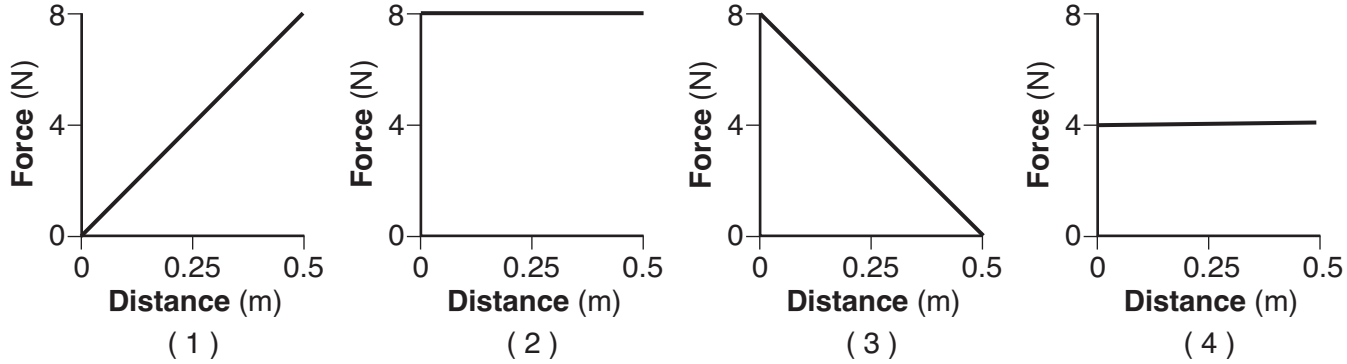


(2)



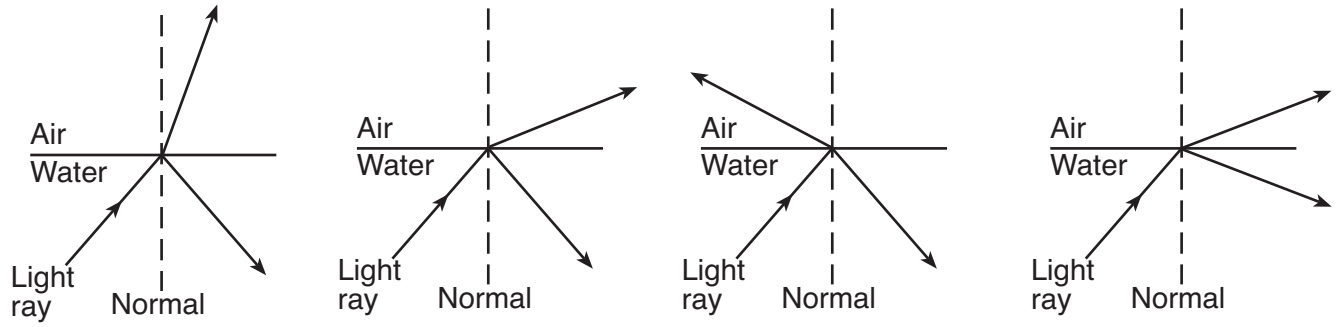
(4)

48 Which graph best represents the greatest amount of work?



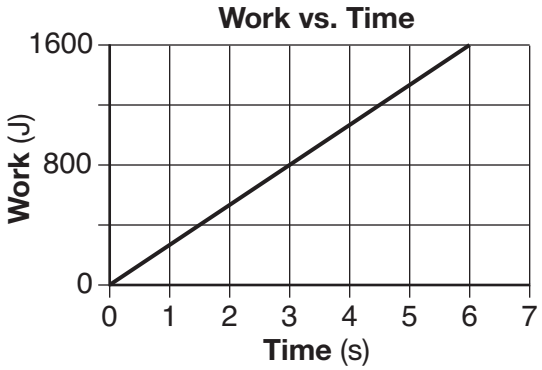
(1) (2) (3) (4)

49 When a ray of light traveling in water reaches a boundary with air, part of the light ray is reflected and part is refracted. Which ray diagram best represents the paths of the reflected and refracted light rays?



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

50 The graph below represents the work done against gravity by a student as she walks up a flight of stairs at constant speed.



Compared to the power generated by the student after 2.0 seconds, the power generated by the student after 4.0 seconds is

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

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.*

Base your answers to questions 51 through 54 on the information below and the scaled vector diagram in your answer booklet and on your knowledge of physics.

Two forces, a 60.-newton force east and an 80.-newton force north, act concurrently on an object located at point *P*, as shown.

51 Using a ruler, determine the scale used in the vector diagram. [1]

52 Draw the resultant force vector to scale on the diagram *in your answer booklet*. Label the vector "*R*." [1]

53 Determine the magnitude of the resultant force, *R*. [1]

54 Determine the measure of the angle, in degrees, between north and the resultant force, *R*. [1]

55–56 A 3.00-newton force causes a spring to stretch 60.0 centimeters. Calculate the spring constant of this spring. [Show all work, including the equation and substitution with units.] [2]

57 A 7.28-kilogram bowling ball traveling 8.50 meters per second east collides head-on with a 5.45 kilogram bowling ball traveling 10.0 meters per second west. Determine the magnitude of the total momentum of the two-ball system after the collision. [1]

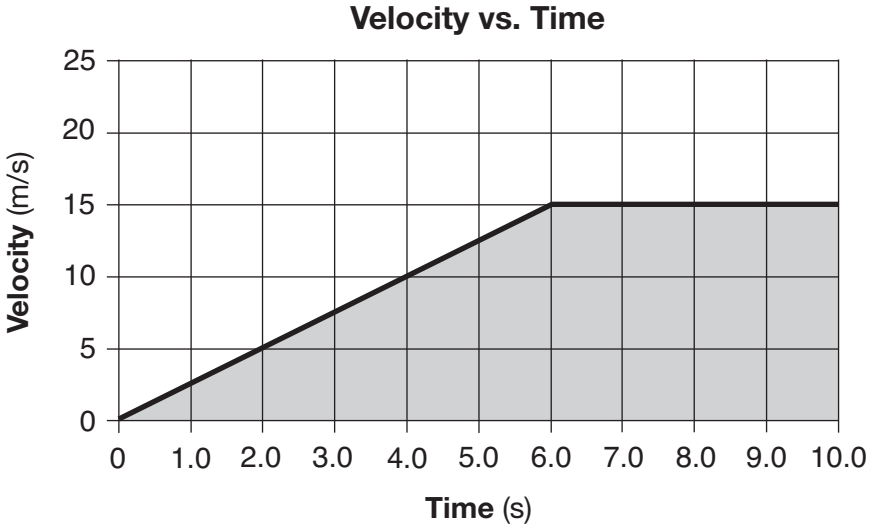
58–59 Calculate the average power required to lift a 490-newton object a vertical distance of 2.0 meters in 10. seconds. [Show all work, including the equation and substitution with units.] [2]

60 The diagram *in your answer booklet* shows wave fronts approaching an opening in a barrier. The size of the opening is approximately equal to one-half the wavelength of the waves. On the diagram *in your answer booklet*, draw the shape of *at least three* of the wave fronts after they have passed through this opening. [1]

61 The diagram *in your answer booklet* shows a mechanical transverse wave traveling to the right in a medium. Point *A* represents a particle in the medium. Draw an arrow originating at point *A* to indicate the initial direction that the particle will move as the wave continues to travel to the right in the medium. [1]

62 Regardless of the method used to generate electrical energy, the amount of energy provided by the source is always greater than the amount of electrical energy produced. Explain why there is a difference between the amount of energy provided by the source and the amount of electrical energy produced. [1]

Base your answers to questions 63 through 65 on the graph below, which represents the relationship between velocity and time for a car moving along a straight line, and your knowledge of physics.



63 Determine the magnitude of the average velocity of the car from t = 6.0 seconds to t = 10. seconds. [1]

64 Determine the magnitude of the car's acceleration during the first 6.0 seconds. [1]

65 Identify the physical quantity represented by the shaded area on the graph. [1]

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 70 on the information below and on your knowledge of physics.

A student constructed a series circuit consisting of a 12.0-volt battery, a 10.0-ohm lamp, and a resistor. The circuit does *not* contain a voltmeter or an ammeter. When the circuit is operating, the total current through the circuit is 0.50 ampere.

66 In the space *in your answer booklet*, draw a diagram of the series circuit constructed to operate the lamp, using symbols from the *Reference Tables for Physical Setting/Physics*. [1]

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

68 Determine the resistance of the resistor. [1]

69–70 Calculate the power consumed by the lamp. [Show all work, including the equation and substitution with the units.] [2]

Base your answers to questions 71 through 75 on the information below and on your knowledge of physics.

Pluto orbits the Sun at an average distance of 5.91×10^{12} meters. Pluto's diameter is 2.30×10^{6} meters and its mass is 1.31×10^{22} kilograms.

Charon orbits Pluto with their centers separated by a distance of 1.96×10^{7} meters. Charon has a diameter of 1.21×10^{6} meters and a mass of 1.55×10^{21} kilograms.

71–72 Calculate the magnitude of the gravitational force of attraction that Pluto exerts on Charon. [Show all work, including the equation and substitution with units.] [2]

73–74 Calculate the magnitude of the acceleration of Charon toward Pluto. [Show all work, including the equation and substitution with units.] [2]

75 State the reason why the magnitude of the Sun's gravitational force on Pluto is greater than the magnitude of the Sun's gravitational force on Charon. [1]

Base your answers to questions 76 through 80 on the information below and on your knowledge of physics.

A horizontal 20.-newton force is applied to a 5.0-kilogram box to push it across a rough, horizontal floor at a constant velocity of 3.0 meters per second to the right.

76 Determine the magnitude of the force of friction acting on the box. [1]

77–78 Calculate the weight of the box. [Show all work, including the equation and substitution with units.] [2]

79–80 Calculate the coefficient of kinetic friction between the box and the floor. [Show all work, including the equation and substitution with units] [2]

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

An electron traveling with a speed of 2.50×10^{6} meters per second collides with a photon having a frequency of 1.00×10^{16} hertz. After the collision, the photon has 3.18×10^{-18} joule of energy.

81–82 Calculate the original kinetic energy of the electron. [Show all work, including the equation and substitution with units.] [2]

83 Determine the energy in joules of the photon before the collision. [1]

84 Determine the energy lost by the photon during the collision. [1]

85 Name *two* physical quantities conserved in the collision. [1]

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P.S./PHYSICS

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING PHYSICS

Friday, June 20, 2014 — 1:15 to 4:15 p.m., only

ANSWER BOOKLET

☐ Male

Student . . . . . Sex: ☐ Female

Teacher . . . . . .

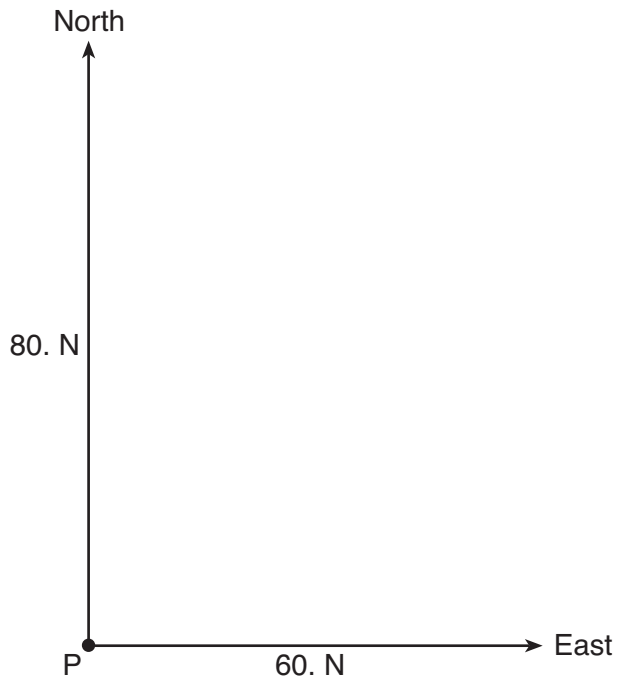
School . . . . . Grade . . . . . .

Record your answers for Part B–2 and Part C in this booklet.

Part B–2

51 1.0 cm = _____ **N**

52



53 _____ **N**

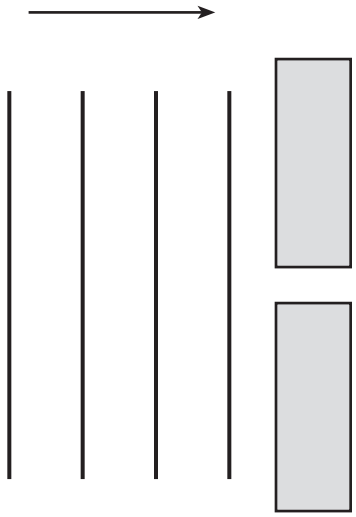
54 _____ °

55–56

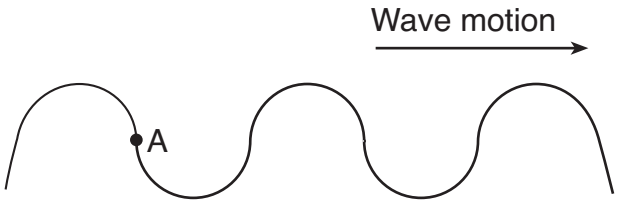
57 _____ kg•m/s

58–59

60



61



62 _____

_____

63 _____ **m/s**

64 _____ **m/s^2**

65 _____

Part C

66

67 _____ Ω

68 _____ Ω

69–70

71–72

73–74

75 _____

_____

76 _____ **N**

77–78

79–80

81–82

83 _____ **J**

84 _____ **J**

85 _____ **and** _____

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P.S./PHYSICS

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

PS–P

PHYSICAL SETTING/PHYSICS

Friday, June 20, 2014 — 1:15 to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:
Refer to the directions on page 2 before rating student papers. Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: http://www.p12.nysed.gov/assessment/ and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Part A and Part B–1

Allow 1 credit for each correct response.

Part A

1 . . . . . **1**	10 . . . . . **1**	19 . . . . . **4**	28 . . . . . **2** . . . . .
2 . . . . . **1**	11 . . . . . **3**	20 . . . . . **1**	29 . . . . . **1** . . . . .
3 . . . . . **2**	12 . . . . . **2**	21 . . . . . **4**	30 . . . . . **2** . . . . .
4 . . . . . **3**	13 . . . . . **2**	22 . . . . . **2**	31 . . . . . **3** . . . . .
5 . . . . . **1**	14 . . . . . **2**	23 . . . . . **4**	32 . . . . . **4** . . . . .
6 . . . . . **3**	15 . . . . . **3**	24 . . . . . **1**	33 . . . . . **3** . . . . .
7 . . . . . **4**	16 . . . . . **1**	25 . . . . . **4**	34 . . . . . **1** . . . . .
8 . . . . . **2**	17 . . . . . **4**	26 . . . . . **2**	35 . . . . . **1** . . . . .
9 . . . . . **2**	18 . . . . . **2**	27 . . . . . **3**	

Part B–1

36 . . . . . **3**	40 . . . . . **1**	44 . . . . . **4**	48 . . . . . **2** . . . . .
37 . . . . . **2**	41 . . . . . **2**	45 . . . . . **3**	49 . . . . . **2** . . . . .
38 . . . . . **3**	42 . . . . . **1**	46 . . . . . **1**	50 . . . . . **1** . . . . .
39 . . . . . **3**	43 . . . . . **3**	47 . . . . . **4**	

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Physical Setting/Physics examination. Additional information about scoring is provided in the publication *Information for Scoring Regents Examinations in the Sciences,* which may be found on the Department web site at http://www.p12.nysed.gov/assessment/science/science-hs.html.

Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

For Part A and Part B–1, indicate by means of a check mark each incorrect or omitted answer. In the box provided at the end of each part, record the number of questions the student answered correctly for that part.

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge as indicated by the examples in the rating guide.

Fractional credit is *not* allowed. Only whole-number credit may be given to a response. Units need not be given when the wording of the questions allows such omissions.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet, and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw score on the written test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Friday, June 20, 2014. The student's scale score should be entered in the labeled box on the student's answer booklet. The scale score is the student's final examination score. On the front of the student's answer booklet, raters must enter their initials on the lines next to "Rater 1" or "Rater 2."

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Teachers should become familiar with the Department publication *Regents Examination in Physical Setting/Physics: Rating Guide for Parts B–2 and C*. This publication can be found on the New York State Education Department web site http://www.p12.nysed.gov/assessment/science/phyratg02.pdf. This guide provides a set of directions, along with some examples, to assist teachers in rating parts B–2 and C of the Regents Examination in Physical Setting/Physics.

Scoring Criteria for Calculations

For each question requiring the student to *show all calculations, including the equation and substitution with units*, apply the following scoring criteria:

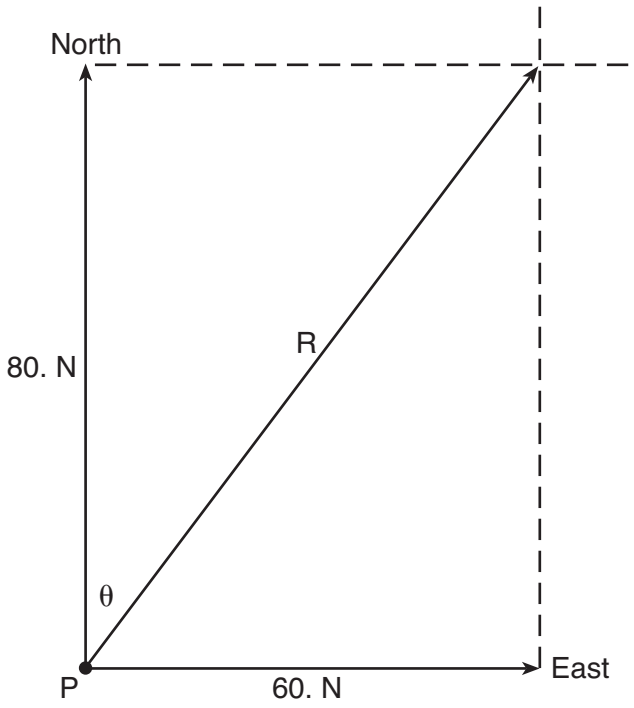
- Allow 1 credit for the equation and substitution of values with units. If the equation and/or substitution with units is not shown, do *not* allow this credit. Allow credit if the student has listed the values with units and written a correct equation.
- Allow 1 credit for the correct answer (number and unit). If the number is given without the unit, allow credit if the credit for units was previously deducted for this calculation problem.
- Penalize a student only once per calculation problem for incorrect or omitted units.
- Allow credit if the answer is not expressed with the correct number of significant figures.

Part B–2

51 [1] Allow 1 credit for 1.0 cm = 10. N ± 1 N.

52 [1] Allow 1 credit for drawing the resultant vector 10.0 cm ± 0.2 cm long at an angle of 37° ± 2° east of north.

Example of a 1-credit response:



Note: Allow credit if the vector is not labeled.
Do *not* allow credit if the arrowhead is missing.

53 [1] Allow 1 credit for 100. N ± 3 N.

Note: Allow credit for an answer that is consistent with the student's response to question 51 or 52.

54 [1] Allow 1 credit for 37° ± 2°.

Note: Allow credit for an answer that is consistent with the student's response to question 52 or 53.

55 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$F_s = kx$ $\qquad$ $F_s = kx$

$k = \frac{F_s}{x}$ $\qquad$ *or* $\qquad$ $k = \frac{F_s}{x}$

$k = \frac{3.00\,\text{N}}{0.600\,\text{m}}$ $\qquad$ $k = \frac{3.00\,\text{N}}{60.0\,\text{cm}}$

56 [1] Allow 1 credit for a correct answer with units.

Examples of 1-credit responses:

$k = 5.00$ N/m $\qquad$ *or* $\qquad$ $k = 0.0500$ N/cm

Note: Allow credit for an answer that is consistent with the student's response to question 55. Do *not* penalize the student more than 1 credit for errors in units in questions 55 and 56.

57 [1] Allow 1 credit for 7.4 kg•m/s $\qquad$ *or* $\qquad$ 7.3 kg•m/s

58 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$P = \frac{Fd}{t}$ $\qquad$ $P = F\bar{v}$

or

$P = \frac{(490\,\text{N})(2.0\,\text{m})}{10.\,\text{s}}$ $\qquad$ $P = (490\text{N})(0.20\text{ m/s})$

59 [1] Allow 1 credit for the correct answer with units.

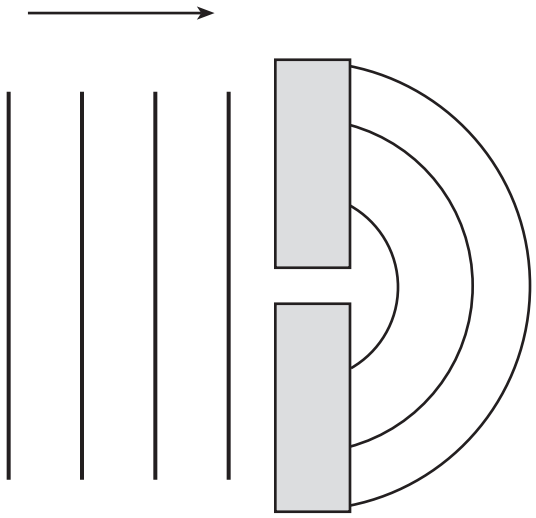
Example of a 1-credit response:

$P = 98$ W

Note: Allow credit for an answer that is consistent with the student's response to question 58. Do *not* penalize the student more than 1 credit for errors in units in questions 58 and 59.

60 [1] Allow 1 credit for at least three curved wavefronts that extend beyond the width of the opening.

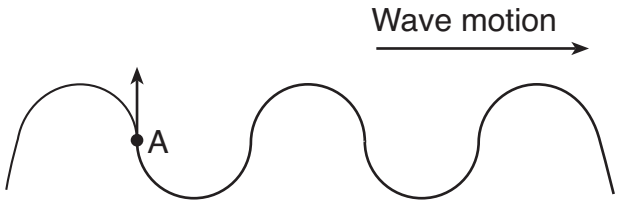
Example of a 1-credit response:



Note: Do *not* deduct credit for drawing wavefronts with an incorrect wavelength or not in contact with the barrier. If more than three lines are drawn, all must be correct to receive credit.

61 [1] Allow 1 credit for an arrow drawn upward at point *A*.

Example of a 1-credit response:



62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— Energy is needed to overcome friction.

— Energy is converted into internal (thermal) energy in the moving parts.

— Energy is converted into sound.

63 [1] Allow 1 credit for 15 m/s.

64 [1] Allow 1 credit for 2.5 m/s^2.

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— displacement

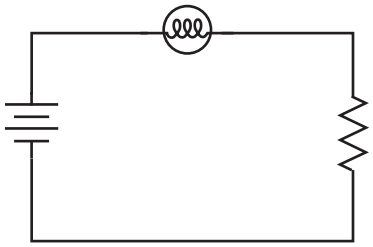
— distance

— how far the car traveled

Part C

66 [1] Allow 1 credit for drawing a series circuit containing a source of potential difference (a battery *or* a cell), a lamp, and one resistor.

Example of a 1-credit response:



Note: Allow credit if the student uses two resistor symbols *or* two lamp symbols, instead of a lamp symbol and a resistor symbol.
Do *not* allow credit if the student adds a voltmeter and/or an ammeter improperly to the circuit.

67 [1] Allow 1 credit for 24 Ω.

68 [1] Allow 1 credit for 14 Ω.

Note: Allow credit for an answer that is consistent with the student's response to questions 66 and 67.

69 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$P = I^2R$

$P = (0.50\ \text{A})^2\ (10.0\ \Omega)$

or

$P = VI$

$P = (5.0\ \text{V})(0.50\ \text{A})$

70 [1] Allow 1 credit for the correct answer with units.

$P = 2.5\ \text{W}$

Note: Allow credit for an answer that is consistent with the student's response to question 69. Do *not* penalize the student more than 1 credit for errors in units in questions 69 and 70.

71 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$$F_g = \frac{Gm_1m_2}{r^2}$$

$$F_g = \frac{\left(6.67 \times 10^{-11}\ \text{N}\bullet\text{m}^2/\text{kg}^2\right)\left(1.31 \times 10^{22}\ \text{kg}\right)\left(1.55 \times 10^{21}\ \text{kg}\right)}{\left(1.96 \times 10^{7}\ \text{m}\right)^2}$$

72 [1] Allow 1 credit for a correct answer with units.

Example of a 1-credit response:

$F_g = 3.53 \times 10^{18}$ N

Note: Allow credit for an answer that is consistent with the student's response to question 71. Do *not* penalize the student more than 1 credit for errors in units in questions 71 and 72.

73 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$$a = \frac{F_{net}}{m} \qquad g = \frac{Gm}{r^2}$$

or

$$a = \frac{3.53 \times 10^{18}\ \text{N}}{1.55 \times 10^{21}\ \text{kg}} \qquad g = \frac{\left(6.67 \times 10^{-11}\ \text{N}\bullet\text{m}^2/\text{kg}^2\right)\left(1.31 \times 10^{22}\ \text{kg}\right)}{\left(1.96 \times 10^{7}\ \text{m}\right)^2}$$

Note: Allow credit for an answer that is consistent with the student's response to question 72.

74 [1] Allow 1 credit for a correct answer with units.

Examples of 1-credit responses:

$a = 2.28 \times 10^{-3}$ m/s^2 *or* 2.27×10^{-3} m/s^2

Note: Allow credit for an answer that is consistent with the student's response to questions 73 and 74. Do *not* penalize the student more than 1 credit for errors in units in questions 73 and 74.

75 [1] Allow 1 credit for indicating that Pluto has a greater mass than Charon.

Note: Do *not* allow credit for indicating only that Pluto is larger than Charon.

76 [1] Allow 1 credit for 20. N.

77 [1] Allow 1 credit for the equation and substitution with units. Refer to Scoring Criteria for Calculations in this rating guide.

Examples of 1-credit responses:

$g = \frac{F_g}{m}$

$F_g = mg$

$F_g = (5.0\text{ kg})(9.81\text{ m/s}^2)$

or

$W = mg$

$W = (5.0\text{ kg})(9.81\text{ m/s}^2)$

78 [1] Allow 1 credit for a correct answer with units.

Example of a 1-credit response:

$F_g = 49\text{ N}$

Note: Allow credit for an answer that is consistent with the student's response to questions 77 and 78. Do *not* penalize the student more than 1 credit for errors in units in questions 77 and 78.

79 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$F_f = \mu F_N$

$\mu = \frac{F_f}{F_N}$

$\mu = \frac{20.\text{ N}}{49\text{ N}}$

Note: Allow credit for an answer that is consistent with the student's response to questions 77 and 78.

80 [1] Allow 1 credit for a correct answer with no units.

Examples of 1-credit responses:

$\mu = 0.41$ *or* 0.40

Note: Allow credit for an answer that is consistent with the student's response to question 79. Do *not* penalize the student more than 1 credit for errors in units in questions 79 and 80.

81 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$KE = \frac{1}{2}mv^2$

$KE = \frac{1}{2}(9.11 \times 10^{-31}\ \text{kg})(2.50 \times 10^{6}\ \text{m/s})^2$

82 [1] Allow 1 credit for a correct answer with units.

Example of a 1-credit response:

$KE = 2.85 \times 10^{-18}$ J

Note: Allow credit for an answer that is consistent with the student's response to question 81. Do *not* penalize the student more than 1 credit for errors in units in questions 81 and 82.

83 [1] Allow 1 credit for 6.63×10^{-18} J.

84 [1] Allow 1 credit for 3.45×10^{-18} J.

Note: Allow credit for an answer that is consistent with the student's response to question 83.

85 [1] Allow 1 credit for *two* acceptable responses. Acceptable responses include, but are not limited to:

— mass

— charge

— momentum

— energy

Regents Examination in Physical Setting/Physics

June 2014

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2014 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Friday, June 20, 2014. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Physics must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.htm.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

June 2014 Physical Setting/Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	2, 3, 4, 7, 12, 13, 14, 19, 20, 21, 22, 23, 28, 30	37, 38, 39, 40, 42, 43, 51, 55, 56, 57, 58, 59, 63, 64	67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 83, 84
Math Key Idea 2		41, 46	
Math Key Idea 3	5, 25, 33	44, 48, 50, 63, 64, 65	
Science Inquiry Key Idea 1		63	
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		49	
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			
Key Idea 3		36	
Key Idea 4		44	55, 56, 76
Key Idea 5		41, 44, 46, 48, 50, 63, 64, 65	
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
4.1	31	62	66
4.3	17, 25, 34, 35	49, 60, 61	
5.1	3	45, 47, 51, 52, 53, 54, 55, 56, 57, 63, 64, 65	76, 79, 80
5.3		43	85
Standard 4			
4.1	11, 12, 13, 14, 15, 19, 22, 31	39, 40, 42, 48, 50, 58, 59, 62	66, 67, 68, 69, 70, 81, 82
4.3	17, 18, 20, 21, 23, 24, 25, 26, 27, 34, 35	41, 49, 60, 61	
5.1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 16, 32, 33	38, 44, 45, 47, 51, 52, 53, 54, 55, 56, 57, 63, 64, 65	71, 72, 73, 74, 75, 76, 77, 78, 79, 80
5.3	28, 29, 30	37, 43, 46	83, 84, 85

Regents Examination in Physical Setting/Physics – June 2014

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

Raw Score	Scale Score
85	**100**
84	**99**
83	**98**
82	**98**
81	**97**
80	**96**
79	**95**
78	**94**
77	**93**
76	**93**
75	**92**
74	**91**
73	**90**
72	**89**
71	**88**
70	**87**
69	**86**
68	**85**
67	**84**
66	**83**
65	**83**
64	**82**

Raw Score	Scale Score
63	**81**
62	**80**
61	**79**
60	**78**
59	**77**
58	**76**
57	**75**
56	**74**
55	**73**
54	**72**
53	**71**
52	**70**
51	**69**
50	**68**
49	**67**
48	**65**
47	**64**
46	**63**
45	**62**
44	**61**
43	**60**
42	**59**

Raw Score	Scale Score
41	**58**
40	**57**
39	**55**
38	**54**
37	**53**
36	**52**
35	**51**
34	**50**
33	**48**
32	**47**
31	**46**
30	**45**
29	**43**
28	**42**
27	**41**
26	**40**
25	**38**
24	**37**
23	**36**
22	**34**
21	**33**
20	**32**

Raw Score	Scale Score
19	**30**
18	**29**
17	**27**
16	**26**
15	**25**
14	**23**
13	**22**
12	**20**
11	**19**
10	**17**
9	**16**
8	**14**
7	**13**
6	**11**
5	**9**
4	**8**
3	**6**
2	**4**
1	**2**
0	**0**

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Physical Setting/Physics.