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

PHYSICAL SETTING
PHYSICS

Wednesday, June 17, 2015 — 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.

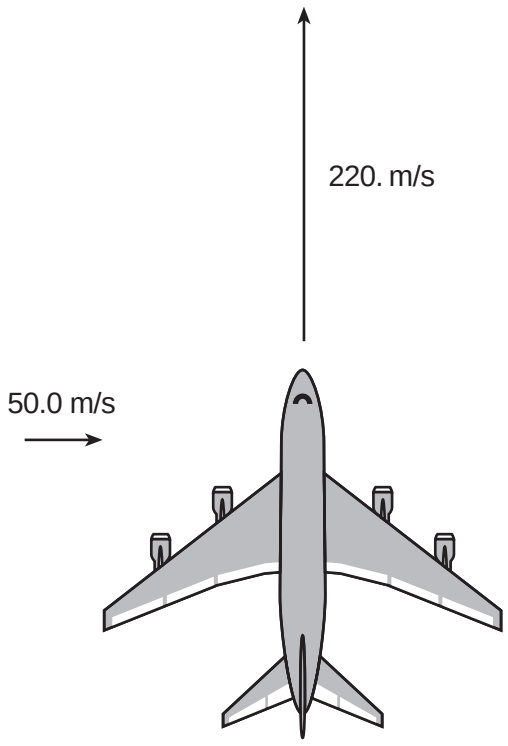
1 Which quantities are scalar?

(1) speed and work
(2) velocity and force
(3) distance and acceleration
(4) momentum and power

2 A 3.00-kilogram mass is thrown vertically upward with an initial speed of 9.80 meters per second. What is the maximum height this object will reach? [Neglect friction.]

(1) 1.00 m
(2) 4.90 m
(3) 9.80 m
(4) 19.6 m

3 An airplane traveling north at 220. meters per second encounters a 50.0-meters-per-second crosswind from west to east, as represented in the diagram below.



What is the resultant speed of the plane?

(1) 170. m/s
(2) 214 m/s
(3) 226 m/s
(4) 270. m/s

4 A 160.-kilogram space vehicle is traveling along a straight line at a constant speed of 800. meters per second. The magnitude of the net force on the space vehicle is

(1) 0 N
(2) 1.60×10^2 N
(3) 8.00×10^2 N
(4) 1.28×10^5 N

5 A student throws a 5.0-newton ball straight up. What is the net force on the ball at its maximum height?

(1) 0.0 N
(2) 5.0 N, up
(3) 5.0 N, down
(4) 9.8 N, down

6 A vertical spring has a spring constant of 100. newtons per meter. When an object is attached to the bottom of the spring, the spring changes from its unstretched length of 0.50 meter to a length of 0.65 meter. The magnitude of the weight of the attached object is

(1) 1.1 N
(2) 15 N
(3) 50. N
(4) 65 N

7 A 1.5-kilogram cart initially moves at 2.0 meters per second. It is brought to rest by a constant net force in 0.30 second. What is the magnitude of the net force?

(1) 0.40 N
(2) 0.90 N
(3) 10. N
(4) 15 N

8 Which characteristic of a light wave must increase as the light wave passes from glass into air?

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

9 As a 5.0×10^2-newton basketball player jumps from the floor up toward the basket, the magnitude of the force of her feet on the floor is 1.0×10^3 newtons. As she jumps, the magnitude of the force of the floor on her feet is

(1) 5.0×10^2 N
(2) 1.0×10^3 N
(3) 1.5×10^3 N
(4) 5.0×10^5 N

10 A 0.0600-kilogram ball traveling at 60.0 meters per second hits a concrete wall. What speed must a 0.0100-kilogram bullet have in order to hit the wall with the same magnitude of momentum as the ball?

(1) 3.60 m/s
(2) 6.00 m/s
(3) 360. m/s
(4) 600. m/s

11 The Hubble telescope's orbit is 5.6×10^5 meters above Earth's surface. The telescope has a mass of 1.1×10^4 kilograms. Earth exerts a gravitational force of 9.1×10^4 newtons on the telescope. The magnitude of Earth's gravitational field strength at this location is

(1) 1.5×10^{-20} N/kg
(2) 0.12 N/kg
(3) 8.3 N/kg
(4) 9.8 N/kg

12 When two point charges are a distance d apart, the magnitude of the electrostatic force between them is F. If the distance between the point charges is increased to $3d$, the magnitude of the electrostatic force between the two charges will be

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

13 A radio operating at 3.0 volts and a constant temperature draws a current of 1.8×10^{-4} ampere. What is the resistance of the radio circuit?

(1) $1.7 \times 10^4\ \Omega$
(2) $3.0 \times 10^1\ \Omega$
(3) $5.4 \times 10^{-4}\ \Omega$
(4) $6.0 \times 10^{-5}\ \Omega$

14 Which energy transformation occurs in an operating electric motor?

(1) electrical → mechanical
(2) mechanical → electrical
(3) chemical → electrical
(4) electrical → chemical

15 A block slides across a rough, horizontal tabletop. As the block comes to rest, there is an increase in the block-tabletop system's

(1) gravitational potential energy
(2) elastic potential energy
(3) kinetic energy
(4) internal (thermal) energy

16 How much work is required to move an electron through a potential difference of 3.00 volts?

(1) 5.33×10^{-20} J
(2) 4.80×10^{-19} J
(3) 3.00 J
(4) 1.88×10^{19} J

17 During a laboratory experiment, a student finds that at 20° Celsius, a 6.0-meter length of copper wire has a resistance of 1.3 ohms. The cross-sectional area of this wire is

(1) 7.9×10^{-8} m^2
(2) 1.1×10^{-7} m^2
(3) 4.6×10^0 m^2
(4) 1.3×10^7 m^2

18 A net charge of 5.0 coulombs passes a point on a conductor in 0.050 second. The average current is

(1) 8.0×10^{-8} A
(2) 1.0×10^{-2} A
(3) 2.5×10^{-1} A
(4) 1.0×10^2 A

19 If several resistors are connected in series in an electric circuit, the potential difference across each resistor

(1) varies directly with its resistance
(2) varies inversely with its resistance
(3) varies inversely with the square of its resistance
(4) is independent of its resistance

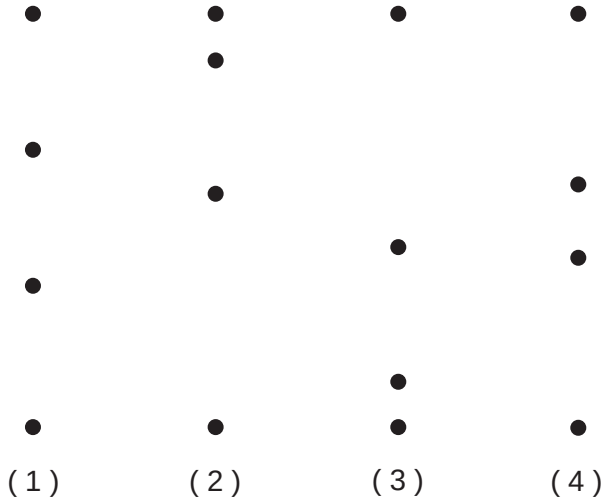
20 The amplitude of a sound wave is most closely related to the sound's

(1) speed
(2) wavelength
(3) loudness
(4) pitch

21 A duck floating on a lake oscillates up and down 5.0 times during a 10.-second interval as a periodic wave passes by. What is the frequency of the duck's oscillations?

(1) 0.10 Hz
(2) 0.50 Hz
(3) 2.0 Hz
(4) 50. Hz

22 Which diagram best represents the position of a ball, at equal time intervals, as it falls freely from rest near Earth's surface?



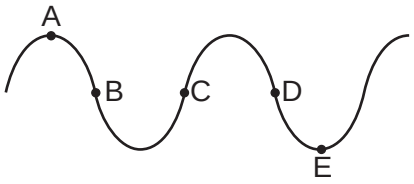
23 A gamma ray and a microwave traveling in a vacuum have the same

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

24 A student produces a wave in a long spring by vibrating its end. As the frequency of the vibration is doubled, the wavelength in the spring is

(1) quartered
(2) halved
(3) unchanged
(4) doubled

25 Which two points on the wave shown in the diagram below are in phase with each other?



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

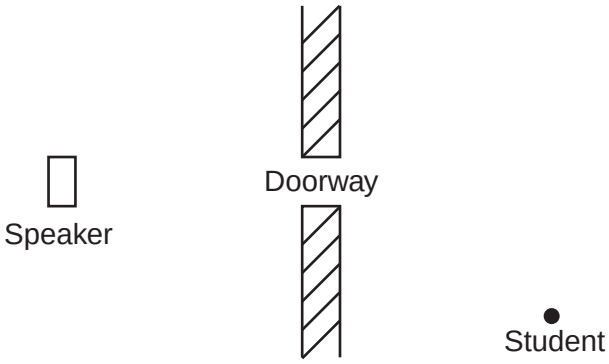
26 As a longitudinal wave moves through a medium, the particles of the medium

(1) vibrate parallel to the direction of the wave's propagation
(2) vibrate perpendicular to the direction of the wave's propagation
(3) are transferred in the direction of the wave's motion, only
(4) are stationary

27 Wind blowing across suspended power lines may cause the power lines to vibrate at their natural frequency. This often produces audible sound waves. This phenomenon, often called an Aeolian harp, is an example of

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

28 A student listens to music from a speaker in an adjoining room, as represented in the diagram below.



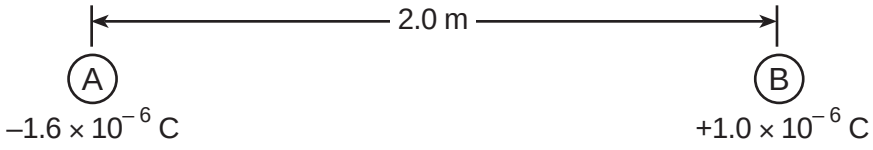
She notices that she does not have to be directly in front of the doorway to hear the music. This spreading of sound waves beyond the doorway is an example of

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

29 What is the minimum energy required to ionize a hydrogen atom in the $n = 3$ state?

(1) 0.00 eV
(2) 0.66 eV
(3) 1.51 eV
(4) 12.09 eV

Base your answers to questions 30 and 31 on the diagram below and on your knowledge of physics. The diagram represents two small, charged, identical metal spheres, *A* and *B* that are separated by a distance of 2.0 meters.



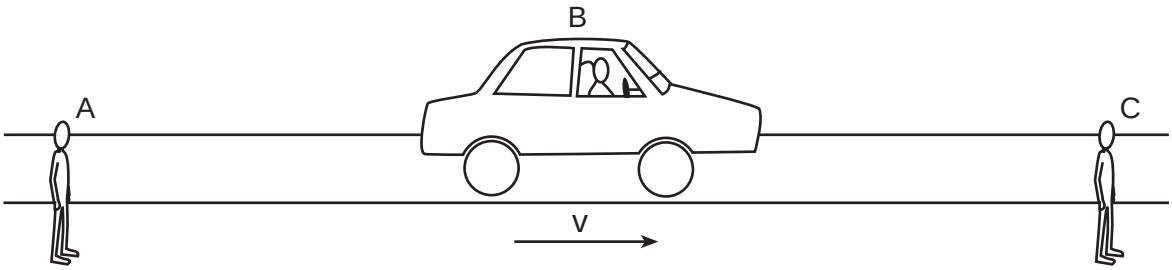
30 What is the magnitude of the electrostatic force exerted by sphere *A* on sphere *B*?

(1) 7.2×10^{-3} N
(2) 3.6×10^{-3} N
(3) 8.0×10^{-13} N
(4) 4.0×10^{-13} N

31 If the two spheres were touched together and then separated, the charge on sphere *A* would be

(1) -3.0×10^{-7} C
(2) -6.0×10^{-7} C
(3) -1.3×10^{-6} C
(4) -2.6×10^{-6} C

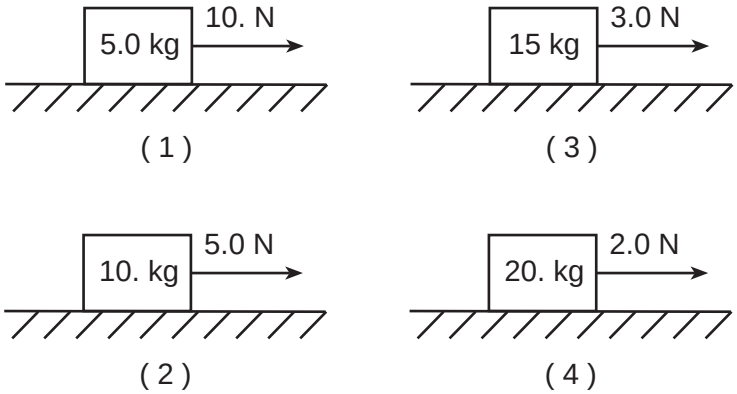
32 The horn of a moving vehicle produces a sound of constant frequency. Two stationary observers, *A* and *C*, and the vehicle's driver, *B*, positioned as represented in the diagram below, hear the sound of the horn.



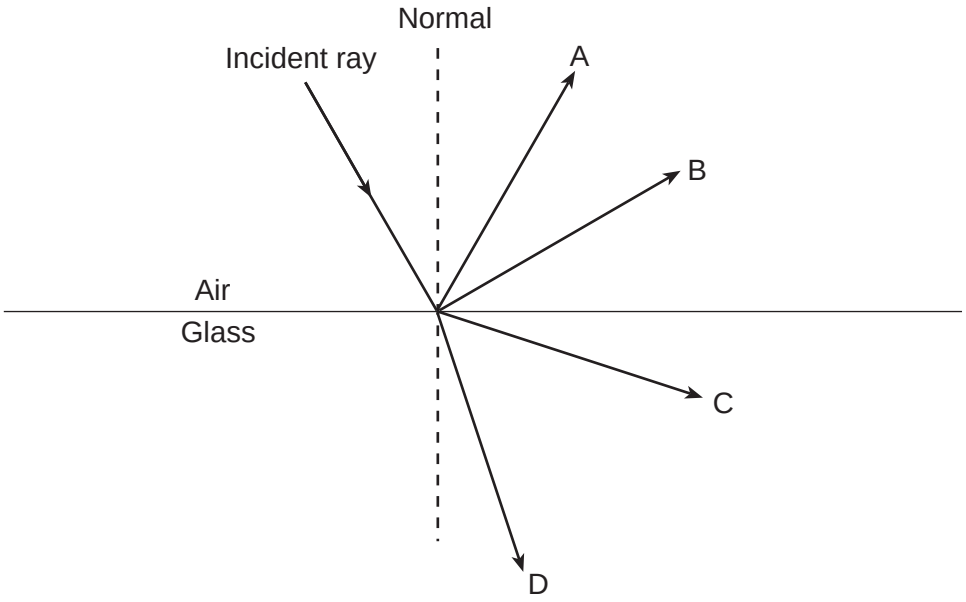
Compared to the frequency of the sound of the horn heard by driver *B*, the frequency heard by observer *A* is

(1) lower and the frequency heard by observer *C* is lower
(2) lower and the frequency heard by observer *C* is higher
(3) higher and the frequency heard by observer *C* is lower
(4) higher and the frequency heard by observer *C* is higher

33 A different force is applied to each of four different blocks on a frictionless, horizontal surface. In which diagram does the block have the greatest inertia 2.0 seconds after starting from rest?



34 The diagram below shows a ray of monochromatic light incident on a boundary between air and glass.



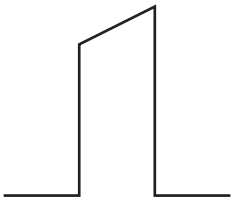
Which ray best represents the path of the reflected light ray?

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

35 Two pulses approach each other in the same medium. The diagram below represents the displacements caused by each pulse.

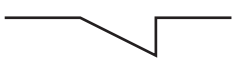
Which diagram best represents the resultant displacement of the medium as the pulses pass through each other?

(1)



(3)

(2)



(4)

Part B–1

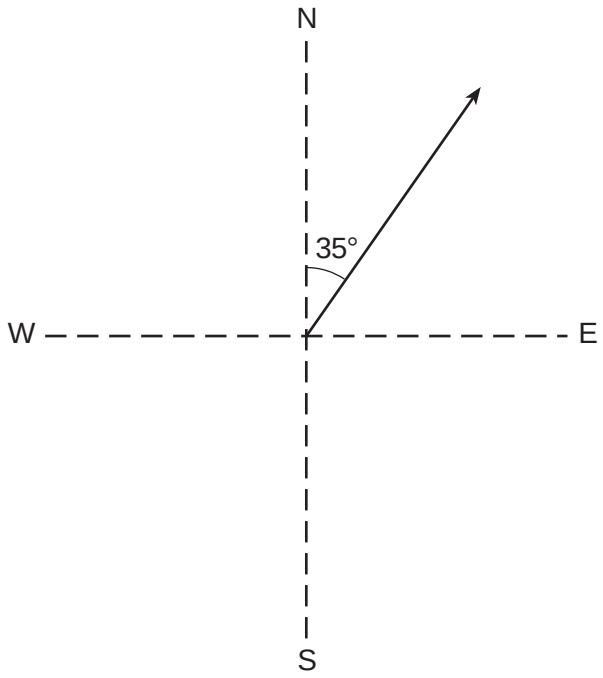
Answer all questions in this part.

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 diameter of an automobile tire is closest to

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

37 The vector diagram below represents the velocity of a car traveling 24 meters per second 35° east of north.



What is the magnitude of the component of the car's velocity that is directed eastward?

(1) 14 m/s
(2) 20. m/s
(3) 29 m/s
(4) 42 m/s

38 Without air resistance, a kicked ball would reach a maximum height of 6.7 meters and land 38 meters away. With air resistance, the ball would travel

(1) 6.7 m vertically and more than 38 m horizontally
(2) 38 m horizontally and less than 6.7 m vertically
(3) more than 6.7 m vertically and less than 38 m horizontally
(4) less than 38 m horizontally and less than 6.7 m vertically

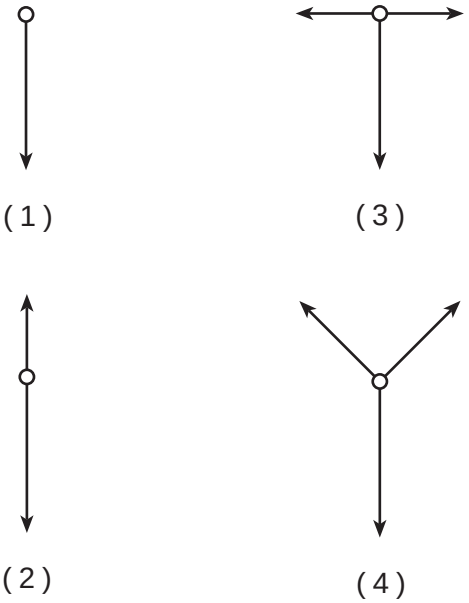
39 A car is moving with a constant speed of 20. meters per second. What total distance does the car travel in 2.0 minutes?

(1) 10. m
(2) 40. m
(3) 1200 m
(4) 2400 m

40 A car, initially traveling at 15 meters per second north, accelerates to 25 meters per second north in 4.0 seconds. The magnitude of the average acceleration is

(1) 2.5 m/s^2
(2) 6.3 m/s^2
(3) 10. m/s^2
(4) 20. m/s^2

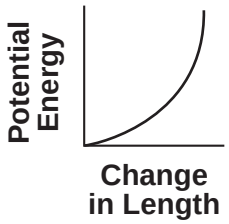
41 An object is in equilibrium. Which force vector diagram could represent the force(s) acting on the object?



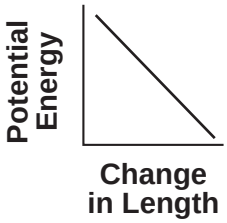
42 Which combination of fundamental units can be used to express the amount of work done on an object?

(1) kg•m/s
(2) kg•m/s^2
(3) kg•m^2/s^2
(4) kg•m^2/s^3

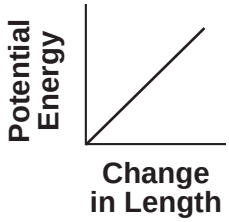
43 Which graph best represents the relationship between the potential energy stored in a spring and the change in the spring's length from its equilibrium position?



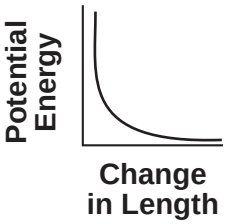
(1)



(3)



(2)



(4)

44 An electric motor has a rating of 4.0×10^2 watts. How much time will it take for this motor to lift a 50.-kilogram mass a vertical distance of 8.0 meters? [Assume 100% efficiency.]

(1) 0.98 s
(2) 9.8 s
(3) 98 s
(4) 980 s

45 A compressed spring in a toy is used to launch a 5.00-gram ball. If the ball leaves the toy with an initial horizontal speed of 5.00 meters per second, the minimum amount of potential energy stored in the compressed spring was

(1) 0.0125 J
(2) 0.0250 J
(3) 0.0625 J
(4) 0.125 J

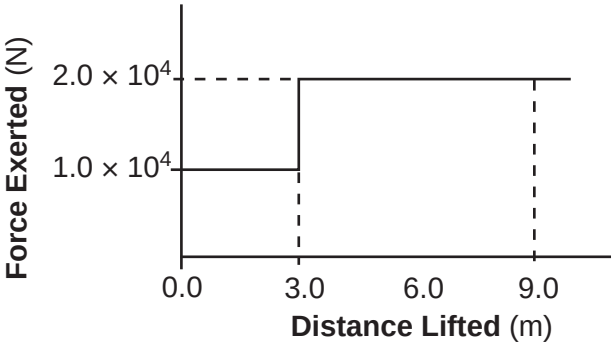
46 A ray of yellow light ($f = 5.09 \times 10^{14}$ Hz) travels at a speed of 2.04×10^8 meters per second in

(1) ethyl alcohol
(2) water
(3) Lucite
(4) glycerol

47 A blue-light photon has a wavelength of 4.80×10^{-7} meter. What is the energy of the photon?

(1) 1.86×10^{22} J
(2) 1.44×10^2 J
(3) 4.14×10^{-19} J
(4) 3.18×10^{-26} J

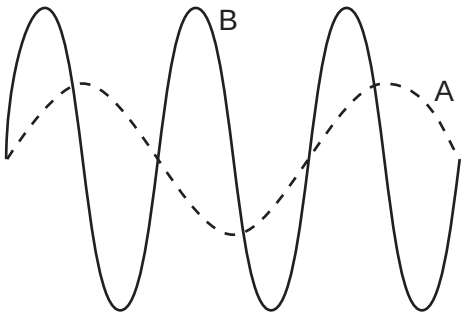
48 The graph below represents the relationship between the force exerted on an elevator and the distance the elevator is lifted.



How much total work is done by the force in lifting the elevator from 0.0 m to 9.0 m?

(1) 9.0×10^4 J
(2) 1.2×10^5 J
(3) 1.5×10^5 J
(4) 1.8×10^5 J

49 The diagram below shows waves *A* and *B* in the same medium.



Compared to wave *A*, wave *B* has

(1) twice the amplitude and twice the wavelength
(2) twice the amplitude and half the wavelength
(3) the same amplitude and half the wavelength
(4) half the amplitude and the same wavelength

50 What is the quark composition of a proton?

(1) uud
(2) udd
(3) csb
(4) uds

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.*

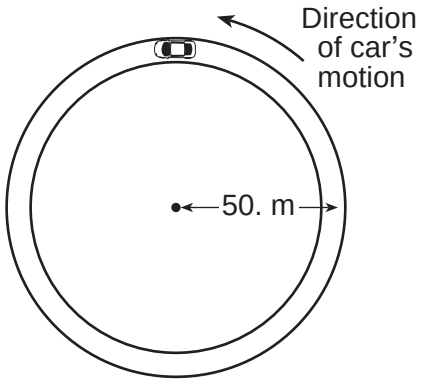
51–52 Calculate the minimum power output of an electric motor that lifts a 1.30×10^4-newton elevator car vertically upward at a constant speed of 1.50 meters per second. [Show all work, including the equation and substitution with units.] [2]

53–54 A microwave oven emits a microwave with a wavelength of 2.00×10^{-2} meter in air. Calculate the frequency of the microwave. [Show all work, including the equation and substitution with units.] [2]

55–56 Calculate the energy equivalent in joules of the mass of a proton. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 57 through 59 on the information and diagram below and on your knowledge of physics.

A 1.5×10^3-kilogram car is driven at a constant speed of 12 meters per second counterclockwise around a horizontal circular track having a radius of 50. meters, as represented below.



Track, as Viewed from Above

57 On the diagram *in your answer booklet*, draw an arrow to indicate the direction of the velocity of the car when it is at the position shown. Start the arrow on the car. [1]

58–59 Calculate the magnitude of the centripetal acceleration of the car. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 60 through 62 on the information below and on your knowledge of physics.

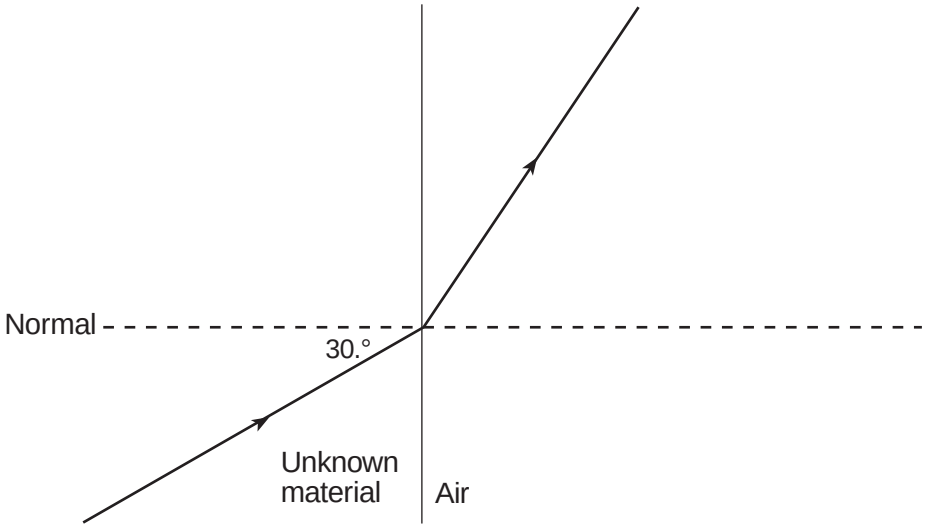
A football is thrown at an angle of 30.° above the horizontal. The magnitude of the horizontal component of the ball's initial velocity is 13.0 meters per second. The magnitude of the vertical component of the ball's initial velocity is 7.5 meters per second. [Neglect friction.]

60 On the axes *in your answer booklet*, draw a graph representing the relationship between the horizontal displacement of the football and the time the football is in the air. [1]

61–62 The football is caught at the same height from which it is thrown. Calculate the total time the football was in the air. [Show all work, including the equation and substitution with units.] [2]

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

A ray of light ($f = 5.09 \times 10^{14}$ Hz) traveling through a block of an unknown material, passes at an angle of incidence of 30.° into air, as shown in the diagram below.



63 Use a protractor to determine the angle of refraction of the light ray as it passes from the unknown material into air. [1]

64–65 Calculate the index of refraction of the unknown material. [Show all work, including the equation and substitution with units.] [2]

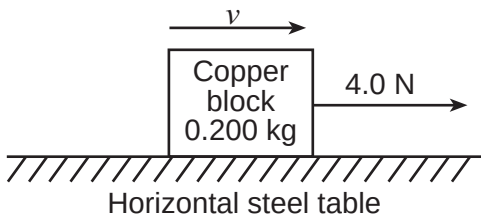
Part C

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

The diagram below represents a 4.0-newton force applied to a 0.200-kilogram copper block sliding to the right on a horizontal steel table.



66 Determine the weight of the block. [1]

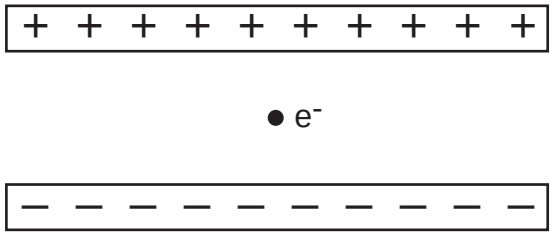
67–68 Calculate the magnitude of the force of friction acting on the moving block. [Show all work, including the equation and substitution with units.] [2]

69 Determine the magnitude of the net force acting on the moving block. [1]

70 Describe what happens to the magnitude of the velocity of the block as the block slides across the table. [1]

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

Two conducting parallel plates 5.0×10^{-3} meter apart are charged with a 12-volt potential difference. An electron is located midway between the plates. The magnitude of the electrostatic force on the electron is 3.8×10^{-16} newton.



71 On the diagram *in your answer booklet*, draw *at least three* field lines to represent the direction of the electric field in the space between the charged plates. [1]

72 Identify the direction of the electrostatic force that the electric field exerts on the electron. [1]

73–74 Calculate the magnitude of the electric field strength between the plates, in newtons per coulomb. [Show all work, including the equation and substitution with units.] [2]

75 Describe what happens to the magnitude of the net electrostatic force on the electron as the electron is moved toward the positive plate. [1]

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

An electron in a mercury atom changes from energy level *b* to a higher energy level when the atom absorbs a single photon with an energy of 3.06 electronvolts.

76 Determine the letter that identifies the energy level to which the electron jumped when the mercury atom absorbed the photon. [1]

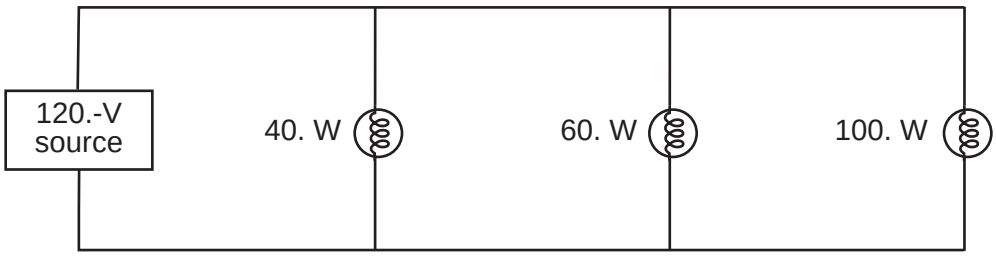
77 Determine the energy of the photon, in joules. [1]

78–79 Calculate the frequency of the photon. [Show all work, including the equation and substitution with units.] [2]

80 Classify the photon as one of the types of electromagnetic radiation listed in the electromagnetic spectrum. [1]

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

Three lamps are connected in parallel to a 120.-volt source of potential difference, as represented below.



81–82 Calculate the resistance of the 40.-watt lamp. [Show all work, including the equation and substitution with units.] [2]

83 Describe what change, if any, would occur in the power dissipated by the 100.-watt lamp if the 60.-watt lamp were to burn out. [1]

84 Describe what change, if any, would occur in the equivalent resistance of the circuit if the 60.-watt lamp were to burn out. [1]

85 The circuit is disassembled. The same three lamps are then connected in series with each other and the source. Compare the equivalent resistance of this series circuit to the equivalent resistance of the parallel circuit. [1]

P.S./PHYSICS

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Wednesday, June 17, 2015 — 1:15 to 4:15 p.m., only

ANSWER BOOKLET

Student . . . . . Sex: ☐ Male ☐ Female

Teacher . . . . .

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

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

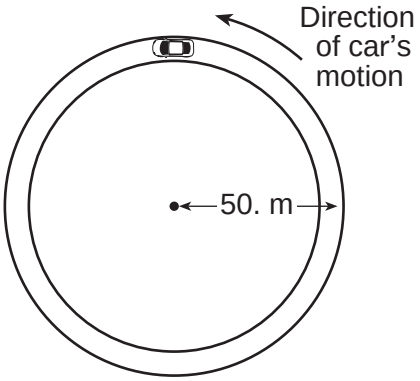
Part B–2

51–52

53–54

55–56

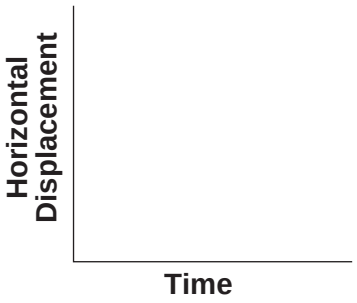
57



Track, as Viewed from Above

58–59

60



61–62

63 _____ °

64–65

Part C

66 _____ **N**

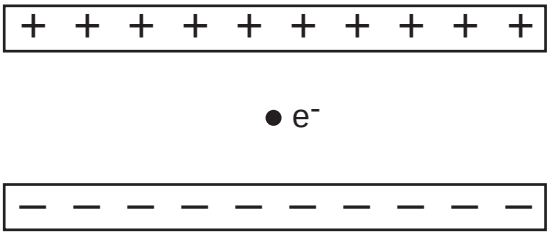
67–68

69 _____ **N**

70 _____

_____

71



72 _____

73–74

75 _____

_____

76 _____

77 _____ **J**

78–79

80 _____

81–82

83 _____

_____

84 _____

_____

85 _____

_____

P.S./PHYSICS

FOR TEACHERS ONLY

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

PS–P

PHYSICAL SETTING/PHYSICS

Wednesday, June 17, 2015 — 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 . . . . . **3**	19 . . . . . **1**	28 . . . . . **4** . . . . .
2 . . . . . **2**	11 . . . . . **3**	20 . . . . . **3**	29 . . . . . **3** . . . . .
3 . . . . . **3**	12 . . . . . **1**	21 . . . . . **2**	30 . . . . . **2** . . . . .
4 . . . . . **1**	13 . . . . . **1**	22 . . . . . **2**	31 . . . . . **1** . . . . .
5 . . . . . **3**	14 . . . . . **1**	23 . . . . . **3**	32 . . . . . **2** . . . . .
6 . . . . . **2**	15 . . . . . **4**	24 . . . . . **2**	33 . . . . . **4** . . . . .
7 . . . . . **3**	16 . . . . . **2**	25 . . . . . **4**	34 . . . . . **1** . . . . .
8 . . . . . **4**	17 . . . . . **1**	26 . . . . . **1**	35 . . . . . **2** . . . . .
9 . . . . . **2**	18 . . . . . **4**	27 . . . . . **4**	

Part B–1

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

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 Wednesday, June 17, 2015. 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 the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$P = F\overline{v}$

$P = (1.30 \times 10^4 \text{ N})(1.50 \text{ m/s})$

52 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 51.

Example of a 1-credit response:

$P = 1.95 \times 10^4 \text{ W}$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 51 and 52.

53 [1] Allow 1 credit for equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$v = f\lambda$

$f = \frac{v}{\lambda}$

$f = \frac{3.00 \times 10^8 \text{ m/s}}{2.00 \times 10^{-2} \text{ m}}$

54 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 53.

Example of a 1-credit response:

$f = 1.50 \times 10^{10} \text{ Hz}$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 53 and 54.

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:

$E = mc^2$ $\qquad$ 1 u = 931 MeV

or

$E = (1.67 \times 10^{-27}\text{kg})(3.00 \times 10^8 \text{ m/s})^2$ $\qquad$ $\dfrac{1 \text{ eV}}{1.60 \times 10^{-19} \text{ J}} = \dfrac{9.31 \times 10^8 \text{ eV}}{E}$

56 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's answer to question 55.

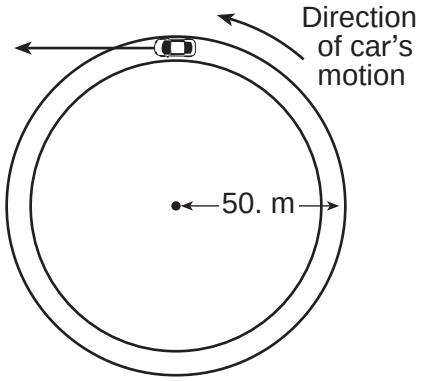
Example of a 1-credit response:

$E = 1.50 \times 10^{-10}$ J

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 55 and 56.

57 [1] Allow 1 credit for an arrow drawn from the car with the arrowhead pointed to the left.

Example of a 1-credit response:



Track, as Viewed from Above

Note: The arrow need *not* start on the car to receive this credit.

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:

$a_c = \dfrac{v^2}{r}$

$a_c = \dfrac{(12 \text{ m/s})^2}{50. \text{ m}}$

59 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 58.

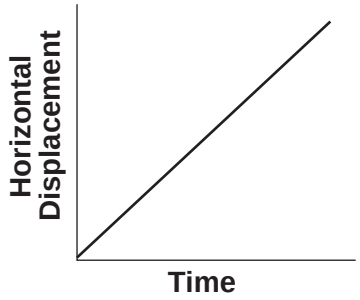
Example of a 1-credit response:

$a_c = 2.9 \text{ m/s}^2$ *or* 2.8 m/s^2

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 58 and 59.

60 [1] Allow 1 credit for a straight line with a positive slope.

Example of a 1-credit response:



Note: The line may be sketched in. It must approximate a straight line, but need not pass through the origin.

61 [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:

$a = \dfrac{\Delta v}{t}$ $\quad t = \dfrac{15.0 \text{ m/s}}{9.81 \text{ m/s}^2}$ *or* $a = \dfrac{\Delta v}{t}$ $\quad t = \dfrac{-7.5 \text{ m/s} - (+7.5 \text{ m/s})}{-9.81 \text{ m/s}^2}$ *or* $a = \dfrac{\Delta v}{t}$ $\quad \dfrac{t}{2} = \dfrac{-7.5 \text{ m/s}}{-9.81 \text{ m/s}^2}$ *or* $d = v_i t + \dfrac{1}{2} at^2$ $\quad 0 \text{ m} = (7.5 \text{ m/s})t + \dfrac{1}{2}(-9.8 \text{ m/s}^2)t^2$

62 [1] Allow 1 credit for a correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 61.

Example of a 1-credit response:

$t = 1.5 \text{ s}$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 61 and 62.

63 [1] Allow 1 credit for 56° ± 2°.

64 [1] Allow 1 credit for the equation and substitution with units *or* for an answer with units consistent with the student's response to question 63. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$n_1 \sin \theta_1 = n_2 \sin \theta_2$

$$n_1 = \frac{n_2 \sin \theta_2}{\sin \theta_1}$$

$$n_1 = \frac{1.00 \sin 56°}{\sin 30.°}$$

65 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to questions 63 and 64.

Example of a 1-credit response:

$n_1 = 1.7$ *or* 1.6

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 64 and 65.

Part C

66 [1] Allow 1 credit for 1.96 N *or* 2.0 N *or* 1.9 N.

67 [1] Allow 1 credit for the equation and substitution with units *or* for an answer, with units, consistent with the student's response to question 66. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$F_f = \mu F_N$

$F_f = (0.36)(1.96\text{ N})$

68 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to questions 66 and 67.

Example of a 1-credit response:

$F_f = 0.71\text{ N}$ *or* 0.70 N

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 67 and 68.

69 [1] Allow 1 credit for 3.3 N *or* an answer that is consistent with the student's response to question 68.

70 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

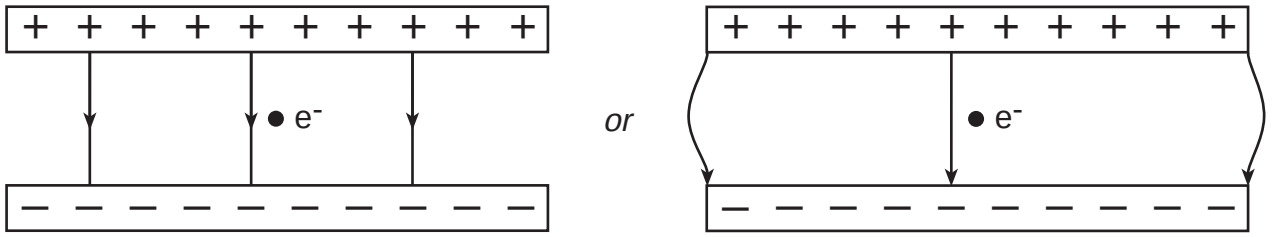
— The magnitude of the velocity increases.

— The block speeds up

Note: Allow credit for an answer consistent with the student's response to question 69.

71 [1] Allow 1 credit for *at least three* arrows pointing away from the positive plate toward the negative plate.

Examples of 1-credit responses:



Note: Use of a straightedge is not necessary to draw the field lines. Field lines near the edge of the plates may be curved.

72 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— toward the positive plate

— toward the top of the page

— opposite the direction of the field

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:

$E = \frac{F_e}{q}$ $\qquad$ $E = \frac{V}{d}$

or

$E = \frac{3.8 \times 10^{-16}\ \text{N}}{1.60 \times 10^{-19}\ \text{C}}$ $\qquad$ $E = \frac{12\ V}{5.0 \times 10^{-3}\ \text{m}}$

74 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 73.

Example of a 1-credit response:

$E = 2.4 \times 10^3$ N/C *or* 2.3×10^3 N/C

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 73 and 74.

75 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

— The force will remain constant.

— The force doesn't change.

76 [1] Allow 1 credit for *f or* energy level *f*.

77 [1] Allow 1 credit for 4.90×10^{-19} J *or* 4.89×10^{-19} J

78 [1] Allow 1 credit for the equation and substitution with units *or* for an answer, with units, that is consistent with the student's response to question 77. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$E_{photon} = hf$

$f = \frac{E_{photon}}{h}$

$f = \frac{4.90 \times 10^{-19}\ \text{J}}{6.63 \times 10^{-34}\ \text{J} \bullet \text{s}}$

79 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to questions 78 and 79.

Example of a 1-credit response:

$f = 7.39 \times 10^{14}$ Hz *or* 7.38×10^{14} Hz

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 78 and 79.

80 [1] Allow 1 credit for the correct answer *or* an answer that is consistent with the student's response to question 79. Acceptable response include but are not limited to:

— visible light

— violet

81 [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:

$P = \frac{V^2}{R}$

$R = \frac{V^2}{P}$

$R = \frac{(120.\ \text{V})^2}{40.\ \text{W}}$

or

$R = \frac{V}{I}$

$R = \frac{120.\ \text{V}}{0.33\ \text{A}}$

82 [1] Allow 1 credit for the correct answer with units *or* for an answer, with units, that is consistent with the student's response to question 81.

Example of a 1-credit response:

$R = 360\ \Omega$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 81 and 82.

83 [1] Allow 1 credit for indicating that there would be no change in the power dissipated.

84 [1] Allow 1 credit for indicating that the equivalent resistance would increase.

85 [1] Allow 1 credit for indicating that the equivalent resistance of the series circuit would be greater than the equivalent resistance of the parallel circuit.

Regents Examination in Physical Setting/Physics

June 2015

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

The *Chart for Determining the Final Examination Score for the June 2015 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Wednesday, June 17, 2015. 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 2015 Physical Setting/Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	2, 3, 6, 7, 10, 13, 16, 17, 18, 30, 31	37, 39, 40, 44, 45, 46, 47, 48, 53, 54, 55, 56, 58, 59, 60, 64, 65	66, 67, 68, 72, 73, 74, 75, 77, 78, 79, 81, 82
Math Key Idea 2	24	43, 48	
Math Key Idea 3		61, 62	
Science Inquiry Key Idea 1			
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	22, 34		
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			80, 84
Key Idea 3		36	
Key Idea 4			
Key Idea 5			
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
4.1	13	43, 51, 52	83, 85
4.3		46, 63, 64, 65	
5.1	3	37, 38, 41, 58, 59	69, 70
5.3			76
Standard 4			
4.1	13, 14, 15, 16, 17, 18, 19	42, 43, 44, 45, 48, 51, 52	81, 82, 83, 84, 85
4.3	8, 20, 21, 23, 24, 25, 26, 27, 28, 32, 34, 35	46, 49, 53, 54, 63, 64, 65	80
5.1	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 22, 30, 33	36, 37, 38, 39, 40, 41, 57, 58, 59, 60, 61, 62	66, 67, 68, 69, 70, 71, 72, 73, 74, 75
5.3	29, 31	47, 50, 55, 56	76, 77, 78, 79

Regents Examination in Physical Setting/Physics – June 2015

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	**82**
64	**81**

Raw Score	Scale Score
63	**80**
62	**79**
61	**78**
60	**77**
59	**76**
58	**75**
57	**74**
56	**73**
55	**72**
54	**71**
53	**70**
52	**69**
51	**68**
50	**67**
49	**66**
48	**65**
47	**63**
46	**62**
45	**61**
44	**60**
43	**59**
42	**58**

Raw Score	Scale Score
41	**56**
40	**55**
39	**54**
38	**53**
37	**52**
36	**51**
35	**49**
34	**48**
33	**47**
32	**46**
31	**44**
30	**43**
29	**42**
28	**41**
27	**39**
26	**38**
25	**37**
24	**36**
23	**34**
22	**33**
21	**32**
20	**30**

Raw Score	Scale Score
19	**29**
18	**28**
17	**26**
16	**25**
15	**23**
14	**22**
13	**21**
12	**19**
11	**18**
10	**16**
9	**15**
8	**13**
7	**12**
6	**10**
5	**9**
4	**7**
3	**5**
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.