The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Wednesday, June 22, 2005 — 1:15 to 4:15 p.m., only

The answer sheet for Part A and Part B–1 is the last page of this examination booklet. Turn to the last page and fold it along the perforations. Then, slowly and carefully, tear off the answer sheet and fill in the heading.

The answer booklet for Part B–2 and Part C is stapled in the center of this examination booklet. Open the examination booklet, carefully remove the answer booklet, and close the examination booklet. Then fill in the heading of your answer booklet.

You are to answer *all* questions in all parts of this examination according to the directions provided in the examination booklet. Record your answers to the Part A and Part B–1 multiple-choice questions on your separate answer sheet. Write your answers to the Part B–2 and Part C questions in your answer booklet. All work 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 the answer sheet and in the answer booklet.

When you have completed the examination, you must sign the statement printed at the end of 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 *2002 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.

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

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, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

1 A 2.0-kilogram body is initially traveling at a velocity of 40. meters per second east. If a constant force of 10. newtons due east is applied to the body for 5.0 seconds, the final speed of the body is

(1) 15 m/s
(2) 25 m/s
(3) 65 m/s
(4) 130 m/s

2 An object is dropped from rest and falls freely 20. meters to Earth. When is the speed of the object 9.8 meters per second?

(1) during the entire first second of its fall
(2) at the end of its first second of fall
(3) during its entire time of fall
(4) after it has fallen 9.8 meters

3 A 5.0-newton force and a 7.0-newton force act concurrently on a point. As the angle between the forces is increased from 0° to 180°, the magnitude of the resultant of the two forces changes from

(1) 0.0 N to 12.0 N
(2) 2.0 N to 12.0 N
(3) 12.0 N to 2.0 N
(4) 12.0 N to 0.0 N

4 A 5.0-newton force could have perpendicular components of

(1) 1.0 N and 4.0 N
(2) 2.0 N and 3.0 N
(3) 3.0 N and 4.0 N
(4) 5.0 N and 5.0 N

5 A golf ball is hit at an angle of 45° above the horizontal. What is the acceleration of the golf ball at the highest point in its trajectory? [Neglect friction.]

(1) 9.8 m/s^2 upward
(2) 9.8 m/s^2 downward
(3) 6.9 m/s^2 horizontal
(4) 0.0 m/s^2

6 At the circus, a 100.-kilogram clown is fired at 15 meters per second from a 500.-kilogram cannon. What is the recoil speed of the cannon?

(1) 75 m/s
(2) 15 m/s
(3) 3.0 m/s
(4) 5.0 m/s

7 A ball is thrown horizontally at a speed of 24 meters per second from the top of a cliff. If the ball hits the ground 4.0 seconds later, approximately how high is the cliff?

(1) 6.0 m
(2) 39 m
(3) 78 m
(4) 96 m

8 Which cart has the greatest inertia?

(1) a 1-kilogram cart traveling at a speed of 4 m/s
(2) a 2-kilogram cart traveling at a speed of 3 m/s
(3) a 3-kilogram cart traveling at a speed of 2 m/s
(4) a 4-kilogram cart traveling at a speed of 1 m/s

9 A container of rocks with a mass of 65.0 kilograms is brought back from the Moon's surface where the acceleration due to gravity is 1.62 meters per $second^2$. What is the weight of the container of rocks on Earth's surface?

(1) 638 N
(2) 394 N
(3) 105 N
(4) 65.0 N

10 An astronaut drops a hammer from 2.0 meters above the surface of the Moon. If the acceleration due to gravity on the Moon is 1.62 meters per $second^2$, how long will it take for the hammer to fall to the Moon's surface?

(1) 0.62 s
(2) 1.2 s
(3) 1.6 s
(4) 2.5 s

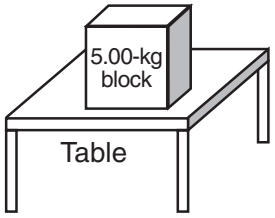
11 The spring in a scale in the produce department of a supermarket stretches 0.025 meter when a watermelon weighing 1.0×10^2 newtons is placed on the scale. The spring constant for this spring is

(1) 3.2×10^5 N/m
(2) 4.0×10^3 N/m
(3) 2.5 N/m
(4) 3.1×10^{-2} N/m

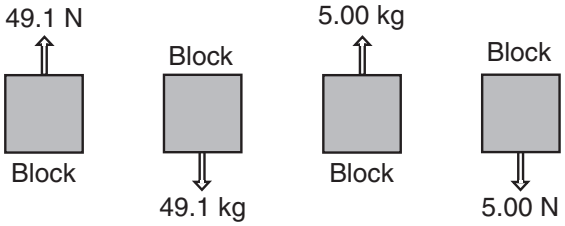
12 A satellite weighs 200 newtons on the surface of Earth. What is its weight at a distance of one Earth radius above the surface of Earth?

(1) 50 N
(2) 100 N
(3) 400 N
(4) 800 N

13 The diagram below shows a 5.00-kilogram block at rest on a horizontal, frictionless table.



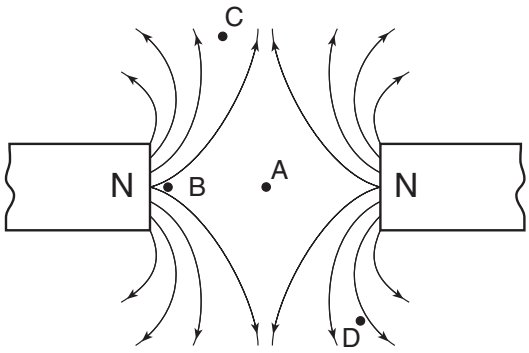
Which diagram best represents the force exerted on the block by the table?



14 Two positively charged masses are separated by a distance, r. Which statement best describes the gravitational and electrostatic forces between the two masses?

(1) Both forces are attractive.
(2) Both forces are repulsive.
(3) The gravitational force is repulsive and the electrostatic force is attractive.
(4) The gravitational force is attractive and the electrostatic force is repulsive.

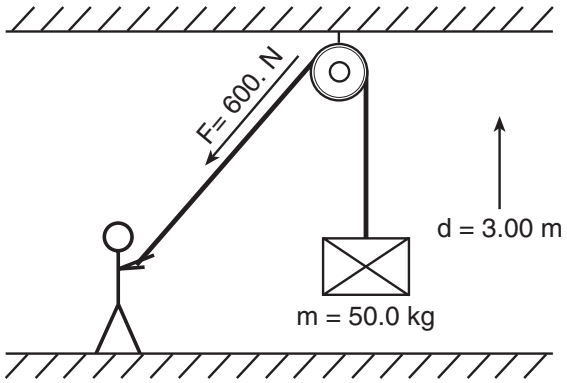
15 The diagram below shows the lines of magnetic force between two north magnetic poles.



At which point is the magnetic field strength greatest?

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

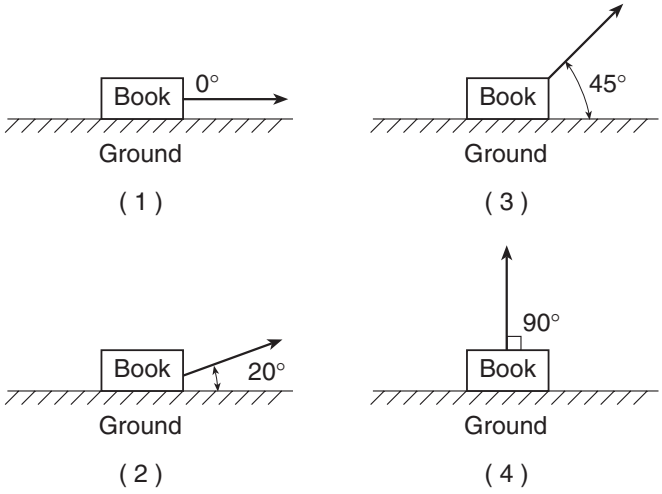
16 As shown in the diagram below, a student exerts an average force of 600. newtons on a rope to lift a 50.0-kilogram crate a vertical distance of 3.00 meters.



Compared to the work done by the student, the gravitational potential energy gained by the crate is

(1) exactly the same
(2) 330 J less
(3) 330 J more
(4) 150 J more

17 A 1.0-kilogram book resting on the ground is moved 1.0 meter at various angles relative to the horizontal. In which direction does the 1.0-meter displacement produce the greatest increase in the book's gravitational potential energy?



18 A 95-kilogram student climbs 4.0 meters up a rope in 3.0 seconds. What is the power output of the student?

(1) 1.3×10^2 W
(2) 3.8×10^2 W
(3) 1.2×10^3 W
(4) 3.7×10^3 W

19 What is the resistance at 20°C of a 1.50-meter-long aluminum conductor that has a cross-sectional area of 1.13×10^{-6} meter^2?

(1) 1.87×10^{-3} Ω
(2) 2.28×10^{-2} Ω
(3) 3.74×10^{-2} Ω
(4) 1.33×10^{6} Ω

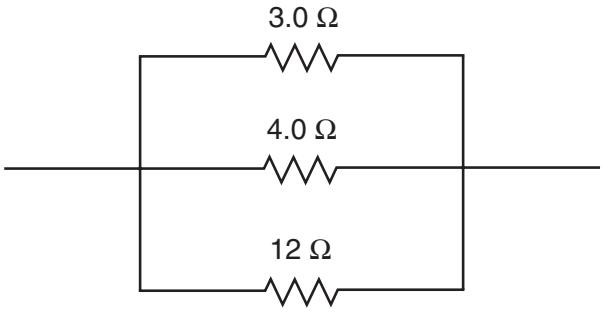
20 The resistance of a 60.-watt lightbulb operated at 120 volts is approximately

(1) 720 Ω
(2) 240 Ω
(3) 120 Ω
(4) 60. Ω

21 An immersion heater has a resistance of 5.0 ohms while drawing a current of 3.0 amperes. How much electrical energy is delivered to the heater during 200. seconds of operation?

(1) 3.0×10^{3} J
(2) 6.0×10^{3} J
(3) 9.0×10^{3} J
(4) 1.5×10^{4} J

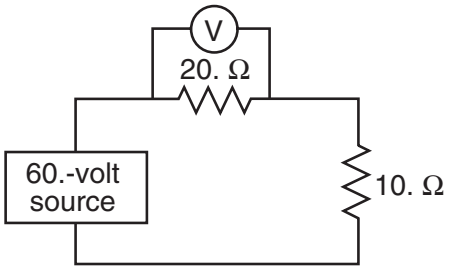
22 The diagram below represents part of an electric circuit containing three resistors.



What is the equivalent resistance of this part of the circuit?

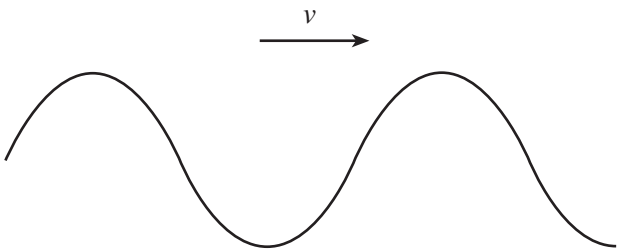
(1) 0.67 Ω
(2) 1.5 Ω
(3) 6.3 Ω
(4) 19 Ω

23 In the circuit represented by the diagram below, what is the reading of voltmeter *V*?

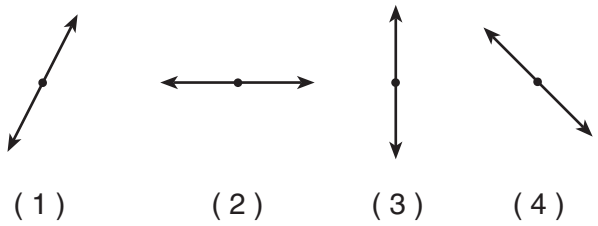


(1) 20. V
(2) 2.0 V
(3) 30. V
(4) 40. V

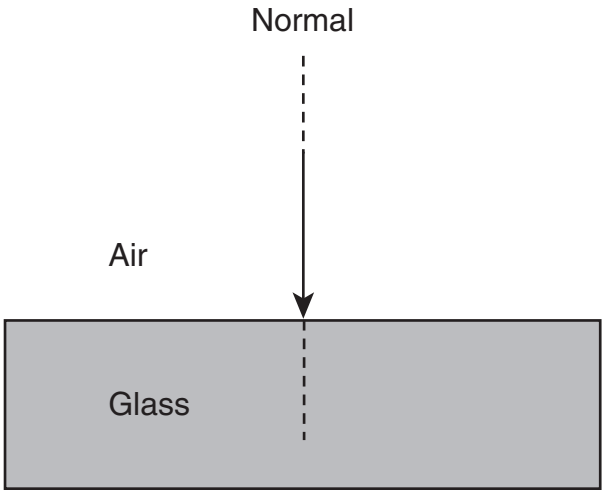
24 A transverse wave passes through a uniform material medium from left to right, as shown in the diagram below.



Which diagram best represents the direction of vibration of the particles of the medium?



25 The diagram below shows a ray of light passing from air into glass at an angle of incidence of 0°.

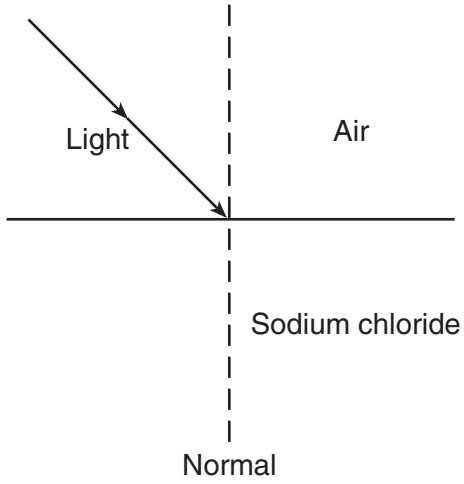


Which statement best describes the speed and direction of the light ray as it passes into the glass?

(1) Only speed changes.
(2) Only direction changes.
(3) Both speed and direction change.
(4) Neither speed nor direction changes.

Note that question 26 has only three choices.

26 A ray of monochromatic light is incident on an air-sodium chloride boundary as shown in the diagram below. At the boundary, part of the ray is reflected back into the air and part is refracted as it enters the sodium chloride.



Compared to the ray's angle of refraction in the sodium chloride, the ray's angle of reflection in the air is

(1) smaller
(2) larger
(3) the same

27 Which pair of terms best describes light waves traveling from the Sun to Earth?

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

28 Which wave characteristic is the same for all types of electromagnetic radiation traveling in a vacuum?

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

29 If the speed of a wave doubles as it passes from shallow water into deeper water, its wavelength will be

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

30 Radio waves diffract around buildings more than light waves do because, compared to light waves, radio waves

(1) move faster
(2) move slower
(3) have a higher frequency
(4) have a longer wavelength

31 A metal sphere has a net negative charge of 1.1×10^{-6} coulomb. Approximately how many more electrons than protons are on the sphere?

(1) 1.8×10^{12}
(2) 5.7×10^{12}
(3) 6.9×10^{12}
(4) 9.9×10^{12}

32 Light of wavelength 5.0×10^{-7} meter consists of photons having an energy of

(1) 1.1×10^{-48} J
(2) 1.3×10^{-27} J
(3) 4.0×10^{-19} J
(4) 1.7×10^{-5} J

33 Wave-particle duality is most apparent in analyzing the motion of

(1) a baseball
(2) a space shuttle
(3) a galaxy
(4) an electron

34 The tau neutrino, the muon neutrino, and the electron neutrino are all

(1) leptons
(2) hadrons
(3) baryons
(4) mesons

35 Which statement is true of the strong nuclear force?

(1) It acts over very great distances.
(2) It holds protons and neutrons together.
(3) It is much weaker than gravitational forces.
(4) It repels neutral charges.

Part B–1

Answer all questions in this part.

Directions (36–47): For *each* statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question.

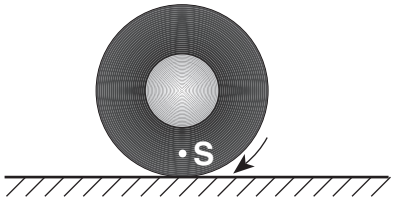
36 The approximate height of a 12-ounce can of root beer is

(1) 1.3×10^{-3} m
(2) 1.3×10^{-1} m
(3) 1.3×10^{0} m
(4) 1.3×10^{1} m

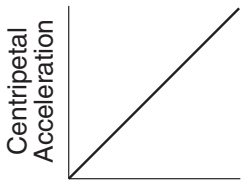
37 Which physical quantity is correctly paired with its unit?

(1) power and watt•seconds
(2) energy and newton•seconds
(3) electric current and amperes/coulomb
(4) electric potential difference and joules/coulomb

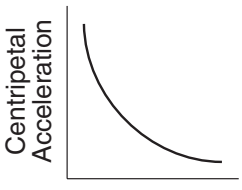
38 In the diagram below, *S* is a point on a car tire rotating at a constant rate.



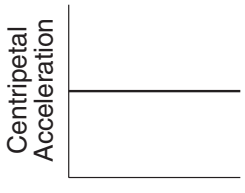
Which graph best represents the magnitude of the centripetal acceleration of point *S* as a function of time?



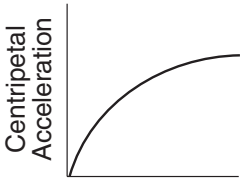
(1)



(3)



(2)



(4)

39 When a 1.53-kilogram mass is placed on a spring with a spring constant of 30.0 newtons per meter, the spring is compressed 0.500 meter. How much energy is stored in the spring?

(1) 3.75 J
(2) 7.50 J
(3) 15.0 J
(4) 30.0 J

40 The current through a lightbulb is 2.0 amperes. How many coulombs of electric charge pass through the lightbulb in one minute?

(1) 60. C
(2) 2.0 C
(3) 120 C
(4) 240 C

41 A 330.-ohm resistor is connected to a 5.00-volt battery. The current through the resistor is

(1) 0.152 mA
(2) 15.2 mA
(3) 335 mA
(4) 1650 mA

Note that question 42 has only three choices.

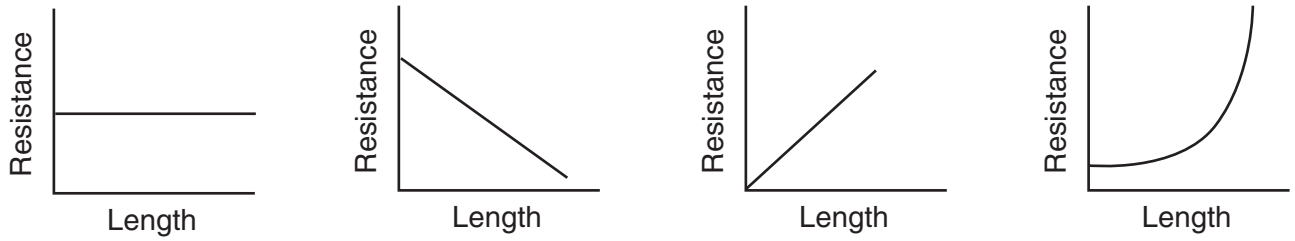
42 Compared to the period of a wave of red light the period of a wave of green light is

(1) less
(2) greater
(3) the same

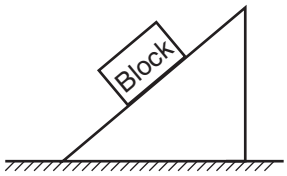
43 A hydrogen atom with an electron initially in the $n = 2$ level is excited further until the electron is in the $n = 4$ level. This energy level change occurs because the atom has

(1) absorbed a 0.85-eV photon
(2) emitted a 0.85-eV photon
(3) absorbed a 2.55-eV photon
(4) emitted a 2.55-eV photon

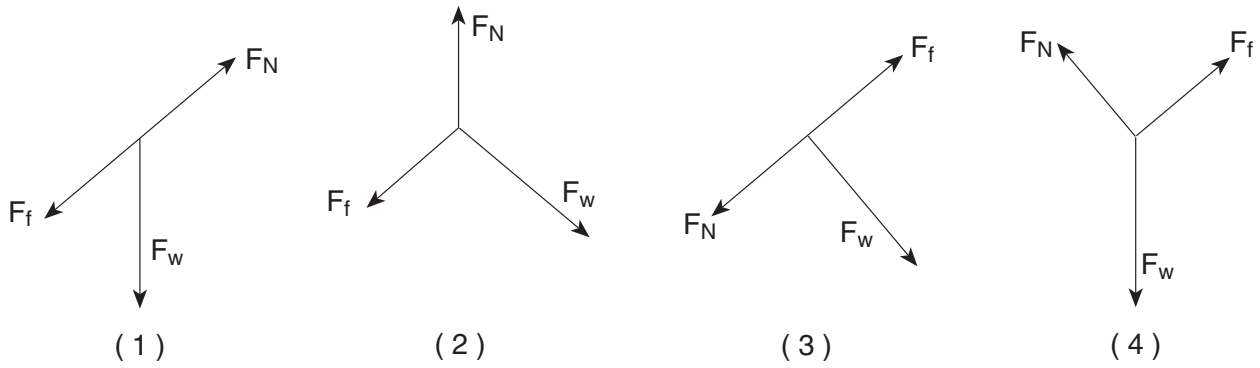
44 Which graph best represents the relationship between resistance and length of a copper wire of uniform cross-sectional area at constant temperature?



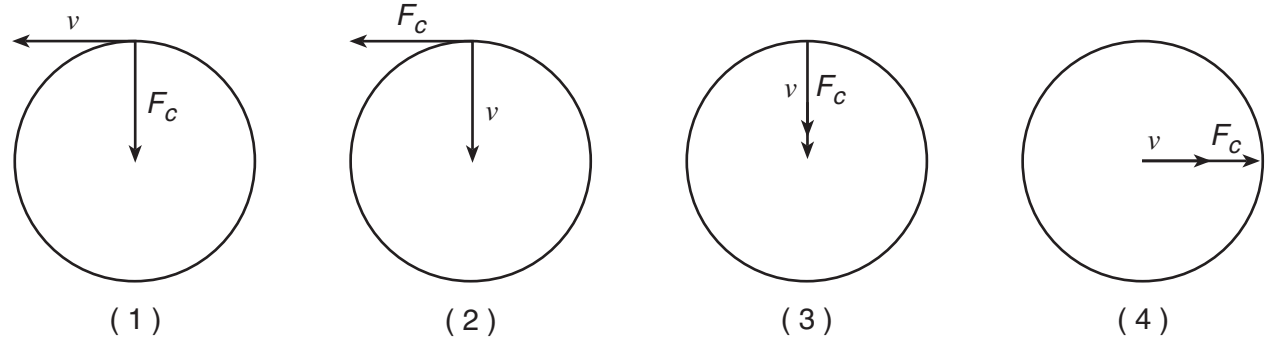
45 The diagram below represents a block at rest on an incline.



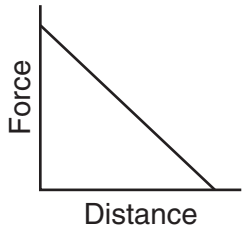
Which diagram best represents the forces acting on the block? (F_f = frictional force, F_N = normal force, and F_w = weight.)



46 A 1.0×10^3-kilogram car travels at a constant speed of 20. meters per second around a horizontal circular track. Which diagram correctly represents the direction of the car's velocity (v) and the direction of the centripetal force (F_c) acting on the car at one particular moment?

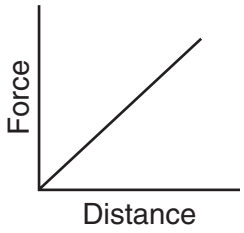


47 Which graph best represents the relationship between the magnitude of the electrostatic force and the distance between two oppositely charged particles?



(1)

(2)



(3)

(4)

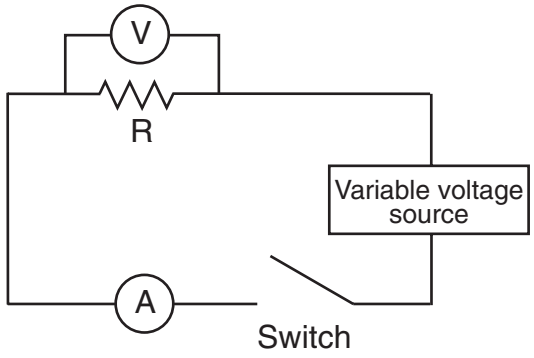
Part B–2

Answer all questions in this part.

Directions (48–61): Record your answers in the spaces provided in your answer booklet.

Base your answers to questions 48 through 51 on the information, circuit diagram, and data table below.

In a physics lab, a student used the circuit shown to measure the current through and the potential drop across a resistor of unknown resistance, *R*. The instructor told the student to use the switch to operate the circuit only long enough to take each reading. The student's measurements are recorded in the data table.



Data Table

Current (A)	**Potential Drop** (V)
0.80	21.4
1.20	35.8
1.90	56.0
2.30	72.4
3.20	98.4

Directions (48–50): Using the information in the data table, construct a graph on the grid *in your answer booklet*, following the directions below.

48 Mark an appropriate scale on the axis labeled "Potential Drop (V)." [1]

49 Plot the data points for potential drop versus current. [1]

50 Draw the line or curve of best fit. [1]

51 Calculate the slope of the line or curve of best fit. [Show all work, including the equation and substitution with units.] [2]

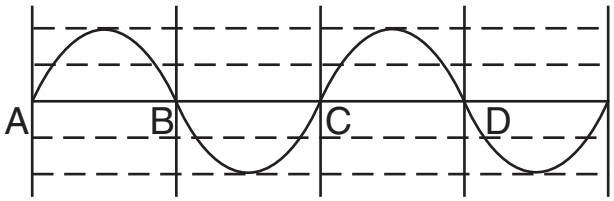
52 An electron is accelerated through a potential difference of 2.5×10^4 volts in the cathode ray tube of a computer monitor. Calculate the work, in joules, done on the electron. [Show all work, including the equation and substitution with units.] [2]

53 A ray of monochromatic light with a frequency of 5.09×10^{14} hertz is transmitted through four different media, listed below.

A. corn oil
B. ethyl alcohol
C. flint glass
D. water

Rank the four media from the one through which the light travels at the slowest speed to the one through which the light travels at the fastest speed. (Use the letters in front of each medium to indicate your answer.) [1]

54 The diagram below represents a transverse wave moving along a string.



On the diagram *in your answer booklet,* draw a transverse wave that would produce complete destructive interference when superimposed with the original wave. [1]

55 How much energy, in megaelectronvolts, is produced when 0.250 universal mass unit of matter is completely converted into energy? [1]

Base your answers to questions 56 and 57 on the information below.

A car traveling at a speed of 13 meters per second accelerates uniformly to a speed of 25 meters per second in 5.0 seconds.

56 Calculate the magnitude of the acceleration of the car during this 5.0-second time interval. [Show all work, including the equation and substitution with units.] [2]

57 A truck traveling at a constant speed covers the same total distance as the car in the same 5.0-second time interval. Determine the speed of the truck. [1]

58 The gravitational force of attraction between Earth and the Sun is 3.52×10^{22} newtons. Calculate the mass of the Sun. [Show all work, including the equation and substitution with units.] [2]

59 What are the sign and charge, in coulombs, of an antiproton? [1]

Base your answers to questions 60 and 61 on the information below.

A lambda particle consists of an up, a down, and a strange quark.

60 A lambda particle can be classified as a

(1) baryon
(2) lepton
(3) meson
(4) photon

61 What is the charge of a lambda particle in elementary charges? [1]

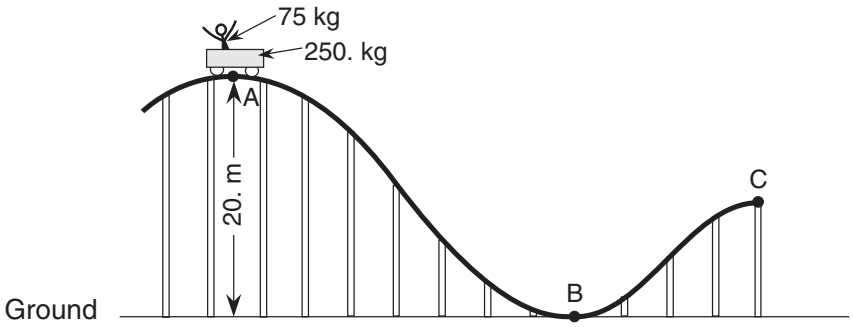
Part C

Answer all questions in this part.

Directions (62–72): Record your answers in the spaces provided in your answer booklet.

Base your answers to questions 62 through 64 on the information and diagram below.

A 250.-kilogram car is initially at rest at point *A* on a roller coaster track. The car carries a 75-kilogram passenger and is 20. meters above the ground at point *A*. [Neglect friction.]



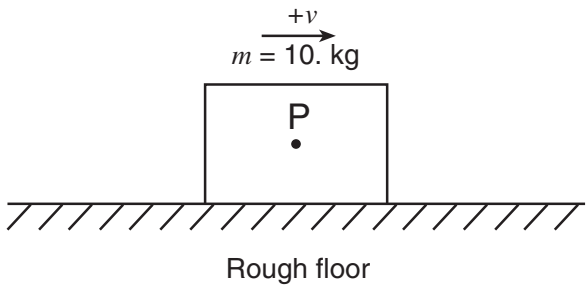
62 Calculate the total gravitational potential energy, relative to the ground, of the car and the passenger at point *A*. [Show all work, including the equation and substitution with units.] [2]

63 Calculate the speed of the car and passenger at point *B*. [Show all work, including the equation and substitution with units.] [2]

64 Compare the total mechanical energy of the car and passenger at points *A*, *B*, and *C*. [1]

Base your answers to questions 65 through 67 on the information and diagram below.

A 10.-kilogram box, sliding to the right across a rough horizontal floor, accelerates at –2.0 meters per second^2 due to the force of friction.



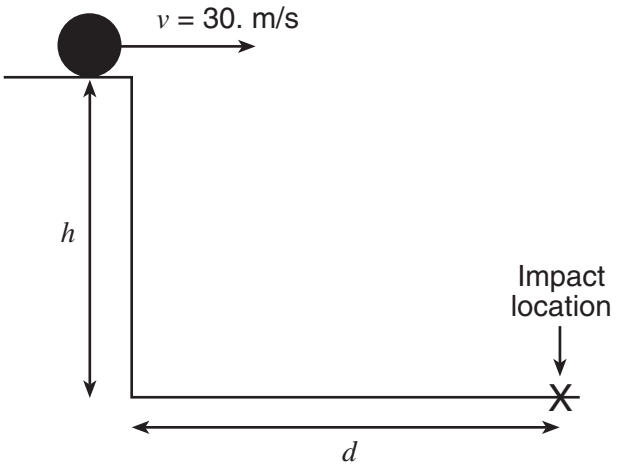
65 Calculate the magnitude of the net force acting on the box. [Show all work, including the equation and substitution with units.] [2]

66 On the diagram *in your answer booklet*, draw a vector representing the net force acting on the box. Begin the vector at point *P* and use a scale of 1.0 centimeter = 5.0 newtons. [2]

67 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 68 through 70 on the information and diagram below.

A projectile is launched horizontally at a speed of 30. meters per second from a platform located a vertical distance h above the ground. The projectile strikes the ground after time t at horizontal distance d from the base of the platform. [Neglect friction.]



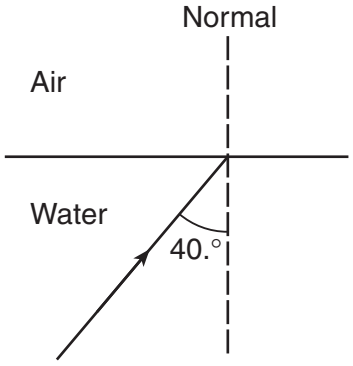
68 On the diagram *in your answer booklet,* sketch the theoretical path of the projectile. [1]

69 Calculate the horizontal distance, d, if the projectile's total time of flight is 2.5 seconds. [Show all work, including the equation and substitution with units.] [2]

70 Express the projectile's total time of flight, t, in terms of the vertical distance, h, and the acceleration due to gravity, g. [Write an appropriate equation and solve it for t.] [2]

Base your answers to questions 71 and 72 on the information and diagram below.

A ray of light of frequency 5.09×10^{14} hertz is incident on a water-air interface as shown in the diagram below.



71 Calculate the angle of refraction of the light ray in air. [Show all work, including the equation and substitution with units.] [2]

72 Calculate the speed of the light while in the water. [Show all work, including the equation and substitution with units.] [2]

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Wednesday, June 22, 2005 — 1:15 to 4:15 p.m., only

ANSWER SHEET

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

Teacher ..... School .....

Record your answers to Part A and Part B–1 on this answer sheet.

Part A

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

Part A Score

Part B–1

36	42 .....
37	43 .....
38	44 .....
39	45 .....
40	46 .....
41	47 .....

Part B–1 Score

Write your answers to Part B–2 and Part C in your answer booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Wednesday, June 22, 2005 — 1:15 to 4:15 p.m., only

ANSWER BOOKLET

Student ..... Sex: ☐ Male ☐ Female

Teacher .....

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

Answer all questions in Part B–2 and Part C. Record your answers in this booklet.

Part	Maximum Score	Student's Score
A	35	
B–1	12	
B–2	18	
C	20	

Total Written Test Score (Maximum Raw Score: 85)

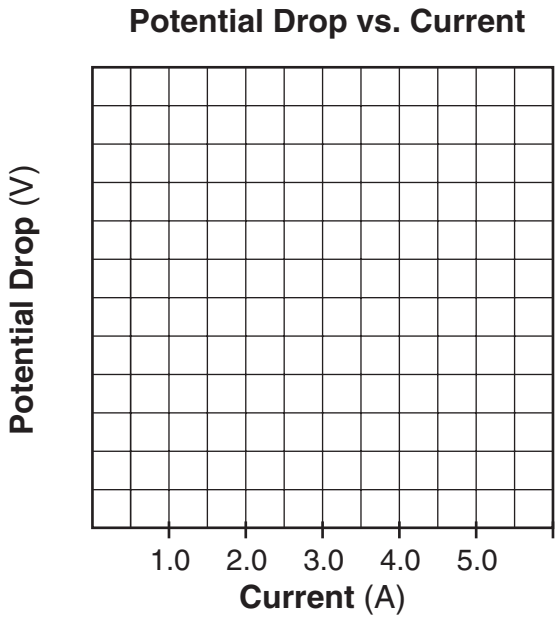
Final Score (From Conversion Chart)

Raters' Initials:

Rater 1 ..... **Rater 2** .....

Part B–2

48–50

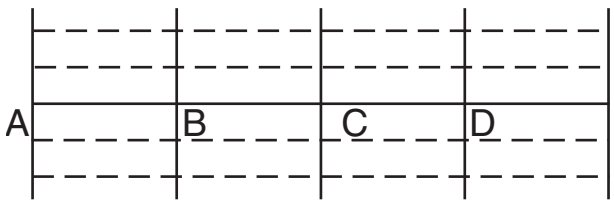


51

52

53 ____ ____ ____ ____

54



55 _____ MeV

56

57 _____ m/s

58

59 _____ C

60 _____

61 _____ e

Part C

62

63

64 _____

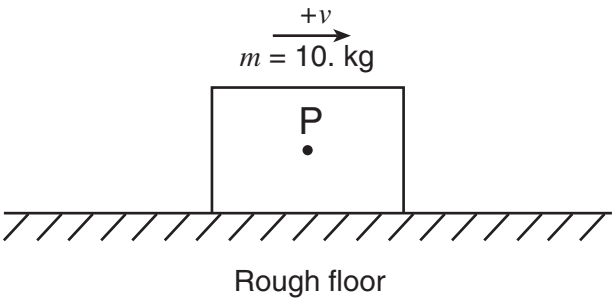
_____

_____

_____

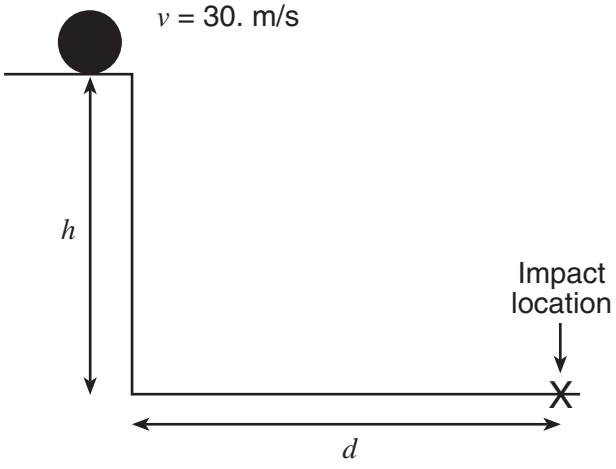
65

66



67

68



69

70

71

72

FOR TEACHERS ONLY

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

PS–P

PHYSICAL SETTING/PHYSICS

Wednesday, June 22, 2005 — 1:15 to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 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. Visit the site http://www.emsc.nysed.gov/osa/ and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

Part A and Part B–1

Allow 1 credit for each correct response.

Part A

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

Part B–1

36 . . . . . **2**	42 . . . . . **1**
37 . . . . . **4**	43 . . . . . **3**
38 . . . . . **2**	44 . . . . . **3**
39 . . . . . **1**	45 . . . . . **4**
40 . . . . . **3**	46 . . . . . **1**
41 . . . . . **2**	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 Administering and Scoring Regents Examinations in the Sciences*.

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the student's work by making insertions or changes of any kind.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a checkmark 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.

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 scaled score by using the conversion chart that will be posted on the Department's web site: http://www.emsc.nysed.gov/osa/ on Wednesday, June 22, 2005. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination 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.

Please refer to 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.emsc.nysed.gov/osa/scire/scirearch/phyratg02.pdf. Teachers should become familiar with this guide before rating students' papers.

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 1 credit for the correct answer (number and unit). If the number is given without the unit, do *not* allow this credit.
- Penalize a student only once per equation for omitting units.
- Allow full credit even if the answer is not expressed with the correct number of significant figures.

Part B–2

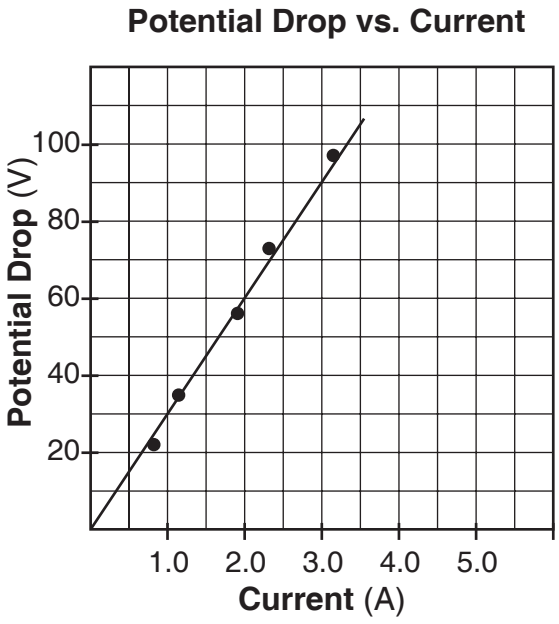
48 Allow 1 credit for marking an appropriate scale on the axis labeled "Potential Drop (V)."

49 Allow 1 credit for plotting all points accurately (±0.3 grid space).

50 Allow 1 credit for drawing the line of best fit. Allow credit for an answer that is consistent with the student's response to questions 48 and/or 49.

48–50

Example of a 3-Credit Graph



51 Allow a maximum of 2 credits. Refer to S*coring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{\Delta V}{\Delta A}$$

$$\text{slope} = \frac{90.V - 30.V}{3.0\,A - 1.0\,A}$$

$$\text{slope} = 30.\frac{V}{A} \quad or \quad 30\,\Omega$$

Allow credit for an answer that is consistent with the student's graph.

Note: The slope may be determined by substitution of data points only if the data values are on the best-fit line or if the student failed to draw a best-fit line.

52 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$$V = \frac{W}{q}$$

$$W = qV$$

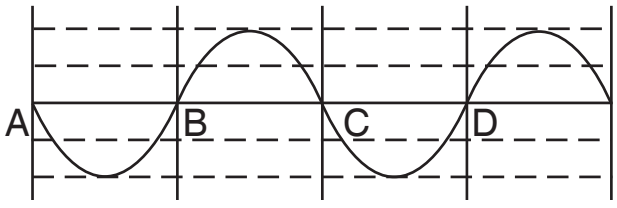
$$W = \left(1.60 \times 10^{-19}\ \text{C}\right)\left(2.5 \times 10^{4}\ V\right)$$

$$W = 4.0 \times 10^{-15}\ \text{J}$$

53 Allow 1 credit for the correct order: *C A B D*. Allow credit even if the student writes the list of materials instead of the letters.

54 Allow 1 credit for drawing a transverse wave that would produce complete destructive interference when superimposed with the original wave.

Example of an Acceptable Response



55 Allow 1 credit for 233 MeV.

56 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$$a = \frac{\Delta v}{t}$$
$$a = \frac{25\ \text{m/s} - 13\ \text{m/s}}{5.0\ \text{s}}$$
$$a = 2.4\ \text{m/s}^2$$

57 Allow 1 credit for 19 m/s.

58 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$$F = G\frac{m_1 m_2}{r^2}$$
$$m_2 = \frac{Fr^2}{Gm_1}$$
$$m_2 = \frac{\left(3.52 \times 10^{22}\,\text{N}\right)\left(1.50 \times 10^{11}\,\text{m}\right)^2}{\left(6.67 \times 10^{-11}\,\frac{\text{N} \bullet \text{m}^2}{\text{kg}^2}\right)\left(5.98 \times 10^{24}\,\text{kg}\right)}$$
$$m_2 = 1.99 \times 10^{30}\,\text{kg}$$

59 Allow 1 credit for -1.6×10^{-19} C.

60 Allow 1 credit for 1.

61 Allow 1 credit for 0e.

Note: Allow credit if the student writes "neutral."

Part C

62 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$\Delta PE = mg\Delta h$

$\Delta PE = (250.\text{ kg} + 75\text{ kg})(9.81\text{ m/s}^2)(20.\text{ m})$

$\Delta PE = 6.4 \times 10^4\text{ J}$

63 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of Acceptable Responses

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

$v = \sqrt{\frac{2\Delta PE}{m}}$

$v = \sqrt{\frac{2(6.4 \times 10^4\text{ J})}{325\text{ kg}}}$

$v = 20.\text{ m/s}$

or

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

$6.4 \times 10^4\text{ J} = \frac{1}{2}(250.\text{ kg} + 75\text{ kg})v^2$

$v^2 = 394$

$v = 20.\text{ m/s}$

Allow credit for an answer that is consistent with the student's response to question 62.

64 Allow 1 credit for indicating that the total mechanical energy is the same at all three points.

65 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$a = \frac{F_{net}}{m}$

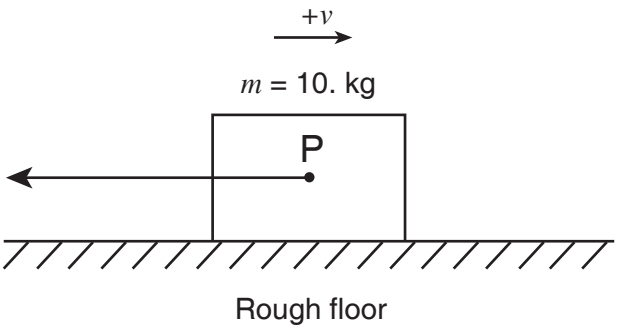
$F_{net} = ma$

$F_{net} = (10.\text{ kg})(-2.0\text{ m/s}^2)$

$F_{net} = -20.\text{ N}$ *or* 20 N

66 Allow a maximum of 2 credits. Allow 1 credit for a length of 4.0 cm (±0.2 cm). Allow 1 credit for drawing a vector directed to the left. Allow credit even if the vector does not begin at point *P*.

Example of a 2-Credit Response



67 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$F_f = \mu F_N$

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

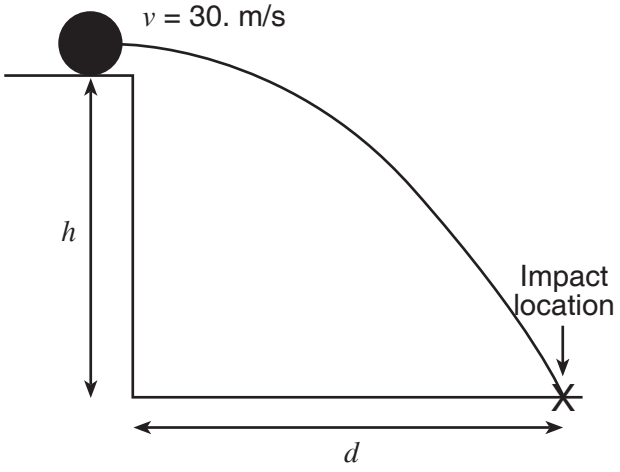
$\mu = \dfrac{20.\,\text{N}}{98.1\,\text{N}}$

$\mu = 0.20$

Allow credit for an answer that is consistent with the student's response to question 65.

68 Allow 1 credit for sketching the theoretical path of the projectile.

Example of an Acceptable Response



69 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of Acceptable Responses

$d = v_i t + \frac{1}{2}at^2$

$d = (30.\ \text{m/s})(2.5\ \text{s}) + \frac{1}{2}(0\ \text{m/s}^2)(2.5\ \text{s})^2$

$d = 75\ \text{m}$

or

$\bar{v} = \frac{d}{t}$

$d = \bar{v}t$

$d = (30.\ \text{m/s})(2.5\ \text{s})$

$d = 75\ \text{m}$

70 Allow a maximum of 2 credits, 1 credit for a correct equation with substitution and 1 credit for solving for t (not t^2).

Examples of Acceptable Responses

$d = v_i t + \frac{1}{2}at^2$

$t = \sqrt{\frac{2d}{a}}$

$t = \sqrt{\frac{2h}{g}}$

or

$h = v_i t + \frac{1}{2}gt^2$

$h = \frac{1}{2}gt^2$

$t = \sqrt{\frac{2h}{g}}$

or

$t = \sqrt{\frac{2h}{g}}$

Note: Allow full credit if d_y or s_y are used in place of h. Allow 1 credit if d is used in place of h.

71 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$
$$\sin\theta_2 = \frac{n_1 \sin\theta_1}{n_2}$$
$$\sin\theta_2 = \frac{(1.33)(\sin 40.^\circ)}{1.00}$$
$$\sin\theta_2 = 0.855$$
$$\theta_2 = 59^\circ \quad \textit{or} \quad 58.7^\circ$$

72 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of Acceptable Responses

$$\frac{n_2}{n_1} = \frac{v_1}{v_2}$$
$$v_1 = \frac{n_2 v_2}{n_1}$$
$$v_1 = \frac{1.00\left(3.00 \times 10^8 \text{ m/s}\right)}{1.33}$$
$$v_1 = 2.26 \times 10^8 \text{ m/s}$$

or

$$n = \frac{c}{v}$$
$$v = \frac{c}{n}$$
$$v = \frac{3.00 \times 10^8 \text{ m/s}}{1.33}$$
$$v = 2.26 \times 10^8 \text{ m/s}$$

Regents Examination in Physical Setting/Physics

June 2005

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

The *Chart for Determining the Final Examination Score for the June 2005 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Wednesday, June 22, 2005. 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.

Map to Core Curriculum

June 2005 Physical Setting/Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	1,2,6,7,9,10,11,12,16,18, 19,20,21,22,23,32	48,49,50,52,55,56,57 ,58	62,63,65,66,67,69, 70,71,72
Math Key Idea 2		38	
Math Key Idea 3		40,51	
Sci. Inq. Key Idea 1			
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3		44,46	68
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			
Key Idea 3		36,41	
Key Idea 4			
Key Idea 5			
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
4.1		39,47,51	64
4.3		42,54	
5.1		45	66
5.3		43	
Standard 4			
4.1	16,17,18,19,20,21,22,23	37,39,40,41,47,51,52	62,63,64
4.3	24,25,26,27,28,29,30	42,53,54	71,72
5.1	1,2,3,4,5,6,7,8,9,10,11,12 13,14,15	38,44,45,46,56,57,58	65,66,67,68,69,70
5.3	31,32,33,34,35	43,55,59,60,61	