The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Thursday, June 22, 2006 — 9:15 a.m. to 12:15 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.

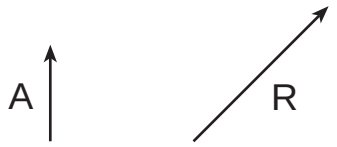
1 A rock falls from rest off a high cliff. How far has the rock fallen when its speed is 39.2 meters per second? [Neglect friction.]

(1) 19.6 m
(2) 44.1 m
(3) 78.3 m
(4) 123 m

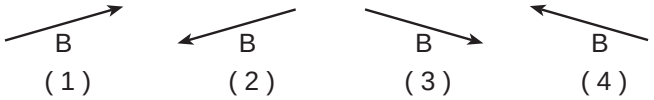
2 A rocket initially at rest on the ground lifts off vertically with a constant acceleration of 2.0×10^1 meters per second^2. How long will it take the rocket to reach an altitude of 9.0×10^3 meters?

(1) 3.0×10^1 s
(2) 4.3×10^1 s
(3) 4.5×10^2 s
(4) 9.0×10^2 s

3 The diagram below represents a force vector, *A*, and a resultant vector, *R*.



Which force vector *B* below could be added to force vector *A* to produce resultant vector *R*?



4 A golf ball is propelled with an initial velocity of 60. meters per second at 37° above the horizontal. The horizontal component of the golf ball's initial velocity is

(1) 30. m/s
(2) 36 m/s
(3) 40. m/s
(4) 48 m/s

5 Which object has the greatest inertia?

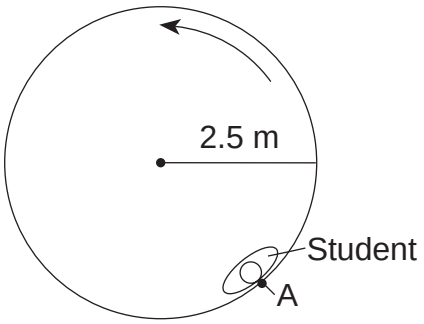
(1) a 1.0-kilogram object moving at 15 meters per second
(2) a 5.0-kilogram object at rest
(3) a 10.-kilogram object moving at 2.0 meters per second
(4) a 15-kilogram object at rest

6 A 3-newton force and a 4-newton force are acting concurrently on a point. Which force could *not* produce equilibrium with these two forces?

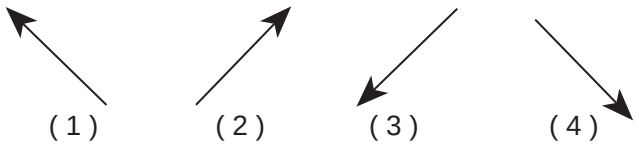
(1) 1 N
(2) 7 N
(3) 9 N
(4) 4 N

Base your answers to questions 7 and 8 on the information and diagram below.

The diagram shows the top view of a 65-kilogram student at point *A* on an amusement park ride. The ride spins the student in a horizontal circle of radius 2.5 meters, at a constant speed of 8.6 meters per second. The floor is lowered and the student remains against the wall without falling to the floor.



7 Which vector best represents the direction of the centripetal acceleration of the student at point *A*?



8 The magnitude of the centripetal force acting on the student at point *A* is approximately

(1) 1.2×10^4 N
(2) 1.9×10^3 N
(3) 2.2×10^2 N
(4) 3.0×10^1 N

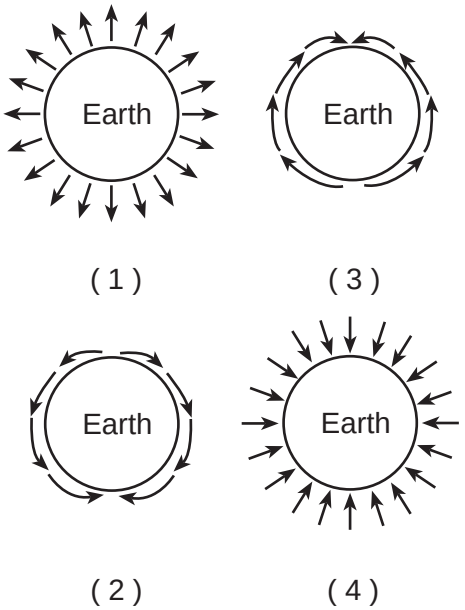
9 A 60-kilogram student jumps down from a laboratory counter. At the instant he lands on the floor his speed is 3 meters per second. If the student stops in 0.2 second, what is the average force of the floor on the student?

(1) 1×10^{-2} N
(2) 1×10^{2} N
(3) 9×10^{2} N
(4) 4 N

10 A positively charged glass rod attracts object *X*. The net charge of object *X*

(1) may be zero or negative
(2) may be zero or positive
(3) must be negative
(4) must be positive

11 Which diagram best represents the gravitational field lines surrounding Earth?



(1) (3)

(2) (4)

12 A 2.0-kilogram block sliding down a ramp from a height of 3.0 meters above the ground reaches the ground with a kinetic energy of 50. joules. The total work done by friction on the block as it slides down the ramp is approximately

(1) 6 J
(2) 9 J
(3) 18 J
(4) 44 J

13 A person weighing 6.0×10^{2} newtons rides an elevator upward at an average speed of 3.0 meters per second for 5.0 seconds. How much does this person's gravitational potential energy increase as a result of this ride?

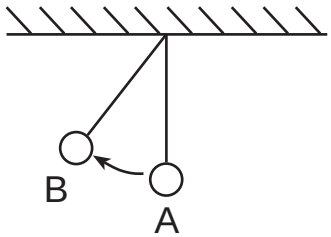
(1) 3.6×10^{2} J
(2) 1.8×10^{3} J
(3) 3.0×10^{3} J
(4) 9.0×10^{3} J

14 The potential energy stored in a compressed spring is to the change in the spring's length as the kinetic energy of a moving body is to the body's

(1) speed
(2) mass
(3) radius
(4) acceleration

Note that question 15 has only three choices.

15 The diagram below shows an ideal simple pendulum.



As the pendulum swings from position *A* to position *B*, what happens to its total mechanical energy? [Neglect friction.]

(1) It decreases.
(2) It increases.
(3) It remains the same.

16 During an emergency stop, a 1.5×10^{3}-kilogram car lost a total of 3.0×10^{5} joules of kinetic energy. What was the speed of the car at the moment the brakes were applied?

(1) 10. m/s
(2) 14 m/s
(3) 20. m/s
(4) 25 m/s

17 Radio waves are propagated through the interaction of

(1) nuclear and electric fields
(2) electric and magnetic fields
(3) gravitational and magnetic fields
(4) gravitational and electric fields

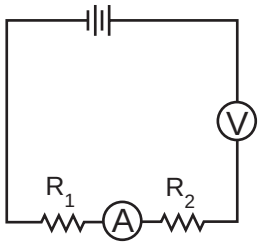
18 What is the resistance at 20.°C of a 2.0-meter length of tungsten wire with a cross-sectional area of 7.9×10^{-7} meter^2?

(1) $5.7 \times 10^{-1}\ \Omega$
(2) $1.4 \times 10^{-1}\ \Omega$
(3) $7.1 \times 10^{-2}\ \Omega$
(4) $4.0 \times 10^{-2}\ \Omega$

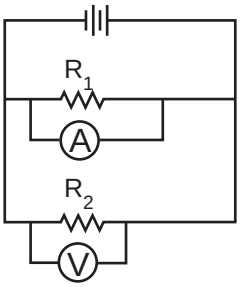
19 A 6.0-ohm resistor that obeys Ohm's Law is connected to a source of variable potential difference. When the applied voltage is decreased from 12 V to 6.0 V, the current passing through the resistor

(1) remains the same
(2) is doubled
(3) is halved
(4) is quadrupled

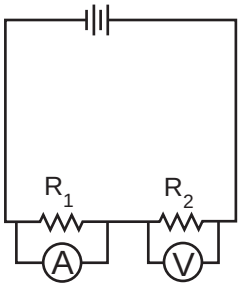
20 In which circuit represented below are meters properly connected to measure the current through resistor R_1 and the potential difference across resistor R_2?



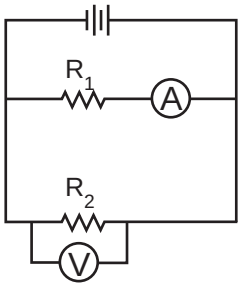
(1)



(3)



(2)



(4)

21 Two identical resistors connected in series have an equivalent resistance of 4 ohms. The same two resistors, when connected in parallel, have an equivalent resistance of

(1) 1 Ω
(2) 2 Ω
(3) 8 Ω
(4) 4 Ω

22 A 50-watt lightbulb and a 100-watt lighbulb are each operated at 110 volts. Compared to the resistance of the 50-watt bulb, the resistance of the 100-watt bulb is

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

23 A device operating at a potential difference of 1.5 volts draws a current of 0.20 ampere. How much energy is used by the device in 60. seconds?

(1) 4.5 J
(2) 8.0 J
(3) 12 J
(4) 18 J

24 As the number of resistors in a parallel circuit is increased, what happens to the equivalent resistance of the circuit and total current in the circuit?

(1) Both equivalent resistance and total current decrease.
(2) Both equivalent resistance and total current increase.
(3) Equivalent resistance decreases and total current increases.
(4) Equivalent resistance increases and total current decreases.

25 The energy of a sound wave is most closely related to its

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

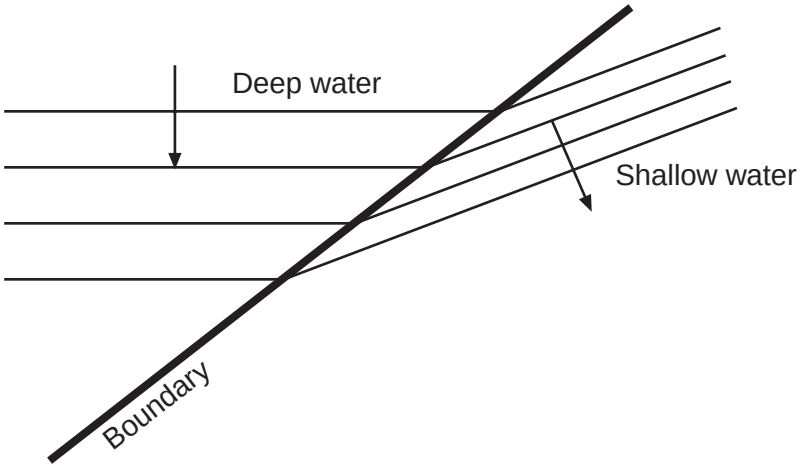
26 A person observes a fireworks display from a safe distance of 0.750 kilometer. Assuming that sound travels at 340. meters per second in air, what is the time between the person seeing and hearing a fireworks explosion?

(1) 0.453 s
(2) 2.21 s
(3) 410. s
(4) 2.55×10^5 s

27 Electromagnetic radiation having a wavelength of 1.3×10^{-7} meter would be classified as

(1) infrared
(2) orange
(3) blue
(4) ultraviolet

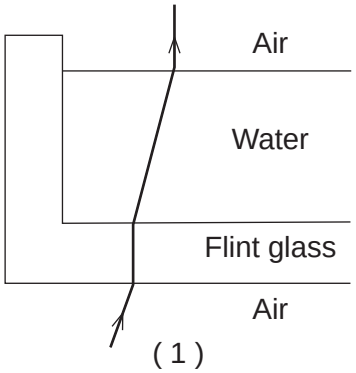
28 The diagram below represents straight wave fronts passing from deep water into shallow water, with a change in speed and direction.



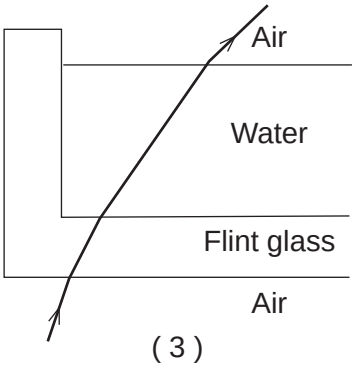
Which phenomenon is illustrated in the diagram?

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

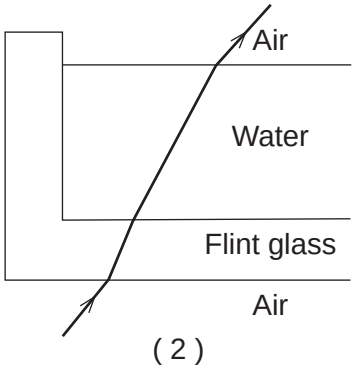
29 Which diagram best represents the path taken by a ray of monochromatic light as it passes from air through the materials shown?



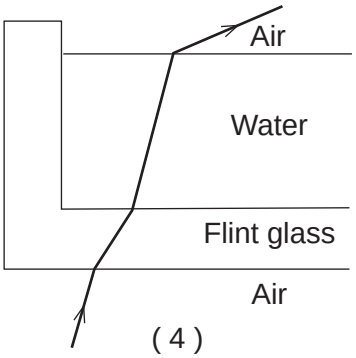
(1)



(3)



(2)



(4)

30 What is the speed of a ray of light ($f = 5.09 \times 10^{14}$ hertz) traveling through a block of sodium chloride?

(1) 1.54×10^8 m/s
(2) 1.95×10^8 m/s
(3) 3.00×10^8 m/s
(4) 4.62×10^8 m/s

31 A girl on a swing may increase the amplitude of the swing's oscillations if she moves her legs at the natural frequency of the swing. This is an example of

(1) the Doppler effect
(2) destructive interference
(3) wave transmission
(4) resonance

32 Two waves traveling in the same medium and having the same wavelength (λ) interfere to create a standing wave. What is the distance between two consecutive nodes on this standing wave?

(1) λ
(2) $\frac{3\lambda}{4}$
(3) $\frac{\lambda}{2}$
(4) $\frac{\lambda}{4}$

33 An earthquake wave is traveling from west to east through rock. If the particles of the rock are vibrating in a north-south direction, the wave must be classified as

(1) transverse
(2) longitudinal
(3) a microwave
(4) a radio wave

34 A top quark has an approximate charge of

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

35 A tritium nucleus is formed by combining two neutrons and a proton. The mass of this nucleus is 9.106×10^{-3} universal mass unit less than the combined mass of the particles from which it is formed. Approximately how much energy is released when this nucleus is formed?

(1) 8.48×10^{-2} MeV
(2) 2.73 MeV
(3) 8.48 MeV
(4) 273 MeV

Part B–1

Answer all questions in this part.

Directions (36–51): 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 length of a dollar bill is approximately

(1) 1.5×10^{-2} m
(2) 1.5×10^{-1} m
(3) 1.5×10^{1} m
(4) 1.5×10^{2} m

37 A 2.0-kilogram object is falling freely near Earth's surface. What is the magnitude of the gravitational force that Earth exerts on the object?

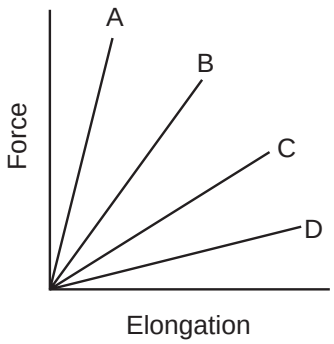
(1) 20. N
(2) 2.0 N
(3) 0.20 N
(4) 0.0 N

38 A force of 6.0 newtons changes the momentum of a moving object by 3.0 kilogram•meters per second. How long did the force act on the mass?

(1) 1.0 s
(2) 2.0 s
(3) 0.25 s
(4) 0.50 s

39 The graph below represents the relationship between the force applied to a spring and spring elongation for four different springs.

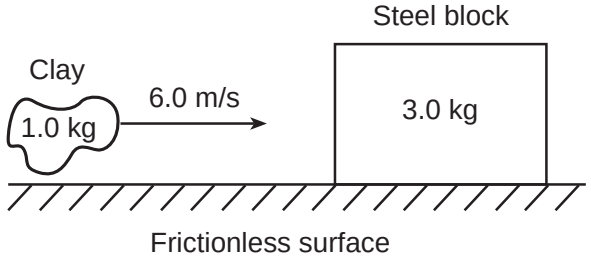
Force vs. Elongation



Which spring has the greatest spring constant?

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

40 A 3.0-kilogram steel block is at rest on a frictionless horizontal surface. A 1.0-kilogram lump of clay is propelled horizontally at 6.0 meters per second toward the block as shown in the diagram below.



Upon collision, the clay and steel block stick together and move to the right with a speed of

(1) 1.5 m/s
(2) 2.0 m/s
(3) 3.0 m/s
(4) 6.0 m/s

41 Which two quantities can be expressed using the same units?

(1) energy and force
(2) impulse and force
(3) momentum and energy
(4) impulse and momentum

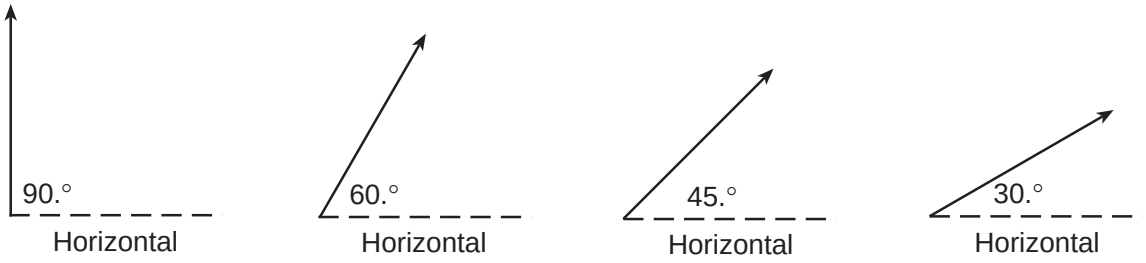
42 What is the magnitude of the electric field intensity at a point where a proton experiences an electrostatic force of magnitude 2.30×10^{-25} newton?

(1) 3.68×10^{-44} N/C
(2) 1.44×10^{-6} N/C
(3) 3.68×10^{6} N/C
(4) 1.44×10^{44} N/C

43 Pieces of aluminum, copper, gold, and silver wire each have the same length and the same cross-sectional area. Which wire has the *lowest* resistance at 20°C?

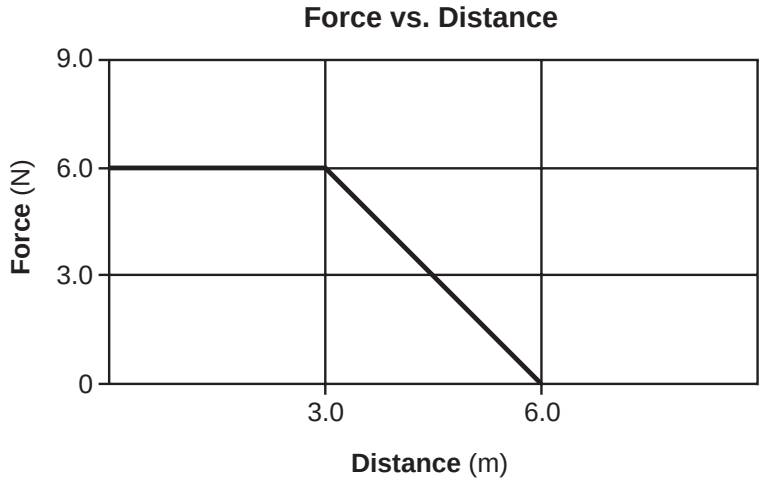
(1) aluminum
(2) copper
(3) gold
(4) silver

44 A volleyball hit into the air has an initial speed of 10. meters per second. Which vector best represents the angle above the horizontal that the ball should be hit to remain in the air for the greatest amount of time?



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

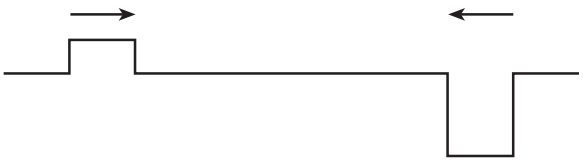
45 A box is pushed to the right with a varying horizontal force. The graph below represents the relationship between the applied force and the distance the box moves.



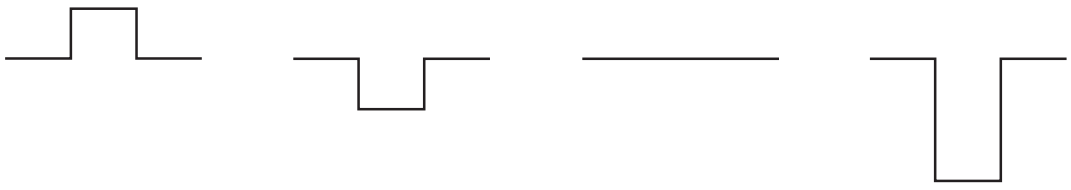
What is the total work done in moving the box 6.0 meters?

(1) 9.0 J
(2) 18 J
(3) 27 J
(4) 36 J

46 The diagram below represents two pulses approaching each other.

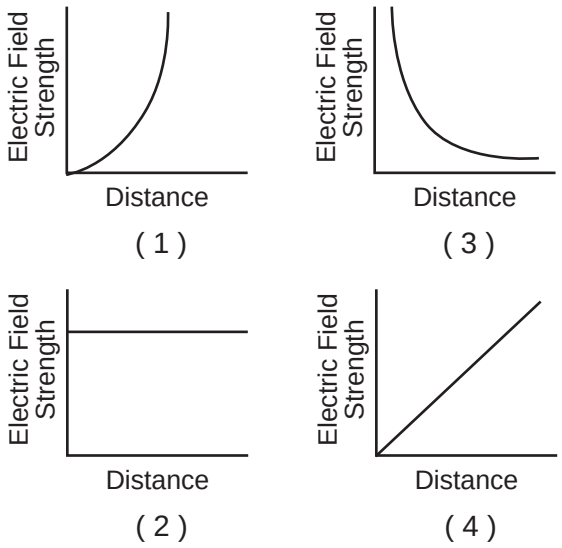


Which diagram best represents the resultant pulse at the instant the pulses are passing through each other?



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

47 Which graph best represents the relationship between the strength of an electric field and distance from a point charge?



48 A 512-hertz sound wave travels 100. meters to an observer through air at STP. What is the wavelength of this sound wave?

(1) 0.195 m
(2) 0.646 m
(3) 1.55 m
(4) 5.12 m

Note that question 49 has only three choices.

49 Compared to the speed of microwaves in a vacuum, the speed of x rays in a vacuum is

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

50 Which type of photon is emitted when an electron in a hydrogen atom drops from the $n = 2$ to the $n = 1$ energy level?

(1) ultraviolet
(2) visible light
(3) infrared
(4) radio wave

51 A lithium atom consists of 3 protons, 4 neutrons, and 3 electrons. This atom contains a total of

(1) 9 quarks and 7 leptons
(2) 12 quarks and 6 leptons
(3) 14 quarks and 3 leptons
(4) 21 quarks and 3 leptons

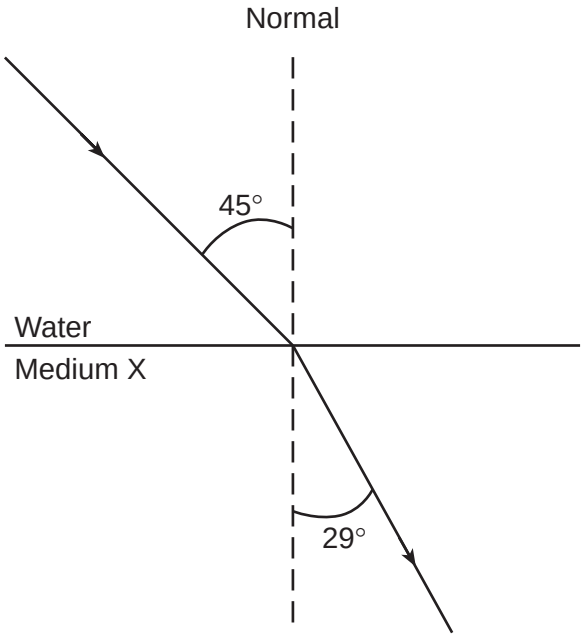
Part B–2

Answer all questions in this part.

Directions (52–60): Record your answers in the spaces provided in your answer booklet.

Base your answers to questions 52 and 53 on the information and diagram below.

A ray of monochromatic light of frequency 5.09×10^{14} hertz is traveling from water into medium *X*. The angle of incidence in water is 45° and the angle of refraction in medium *X* is 29°, as shown.



52 Calculate the absolute index of refraction of medium *X*. [Show all work, including the equation and substitution with units.] [2]

53 Medium *X* is most likely what material? [1]

54 The diagram in your answer booklet represents a transverse wave, *A*, traveling through a uniform medium. On the diagram *in your answer booklet*, draw a wave traveling through the same medium as wave *A* with twice the amplitude and twice the frequency of wave *A*. [2]

55 Explain the difference between a scalar and a vector quantity. [1]

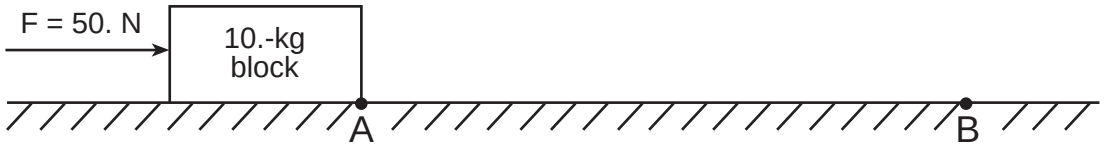
56 A 10.-kilogram rubber block is pulled horizontally at constant velocity across a sheet of ice. Calculate the magnitude of the force of friction acting on the block. [Show all work, including the equation and substitution with units.] [2]

57 Determine the frequency of a photon whose energy is 3.00×10^{-19} joule. [1]

58 If a proton were to combine with an antiproton, they would annihilate each other and become energy. Calculate the amount of energy that would be released by this annihilation. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 59 and 60 on the information and diagram below.

A 10.-kilogram block is pushed across a floor by a horizontal force of 50. newtons. The block moves from point *A* to point *B* in 3.0 seconds.



59 Using a scale of 1.0 centimeter = 1.0 meter, determine the magnitude of the displacement of the block as it moves from point *A* to point *B*. [1]

60 Calculate the power required to move the block from point *A* to point *B* in 3.0 seconds. [Show all work, including the equation and substitution with units.] [2]

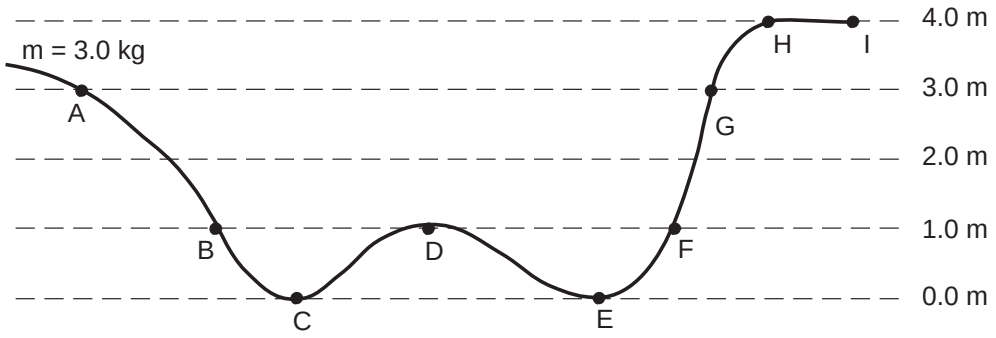
Part C

Answer all questions in this part.

Directions (61–72): Record your answers in the spaces provided in your answer booklet.

Base your answers to questions 61 through 63 on the information and diagram below.

A 3.0-kilogram object is placed on a frictionless track at point *A* and released from rest. (Assume the gravitational potential energy of the system to be zero at point *C*.)



61 Calculate the gravitational potential energy of the object at point *A*. [Show all work, including the equation and substitution with units.] [2]

62 Calculate the kinetic energy of the object at point *B*. [Show all work, including the equation and substitution with units.] [2]

63 Which letter represents the farthest point on the track that the object will reach? [1]

Base your answers to questions 64 through 66 on the information below.

A car on a straight road starts from rest and accelerates at 1.0 meter per second^2 for 10. seconds. Then the car continues to travel at constant speed for an additional 20. seconds.

64 Determine the speed of the car at the end of the first 10. seconds. [1]

65 On the grid *in your answer booklet,* use a ruler or straightedge to construct a graph of the car's speed as a function of time for the entire 30.-second interval. [2]

66 Calculate the distance the car travels in the first 10. seconds. [Show all work, including the equation and substitution with units.] [2]

Base your answers to questions 67 through 69 on the passage and data table below.

The net force on a planet is due primarily to the other planets and the Sun. By taking into account all the forces acting on a planet, investigators calculated the orbit of each planet.

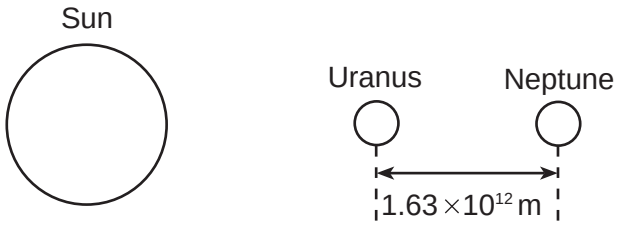
A small discrepancy between the calculated orbit and the observed orbit of the planet Uranus was noted. It appeared that the sum of the forces on Uranus did not equal its mass times its acceleration, unless there was another force on the planet that was not included in the calculation. Assuming that this force was exerted by an unobserved planet, two scientists working independently calculated where this unknown planet must be in order to account for the discrepancy. Astronomers pointed their telescopes in the predicted direction and found the planet we now call Neptune.

Data Table

Mass of the Sun	1.99×10^{30} kg
Mass of Uranus	8.73×10^{25} kg
Mass of Neptune	1.03×10^{26} kg
Mean distance of Uranus to the Sun	2.87×10^{12} m
Mean distance of Neptune to the Sun	4.50×10^{12} m

67 What fundamental force is the author referring to in this passage as a force between planets? [1]

68 The diagram below represents Neptune, Uranus, and the Sun in a straight line. Neptune is 1.63×10^{12} meters from Uranus.



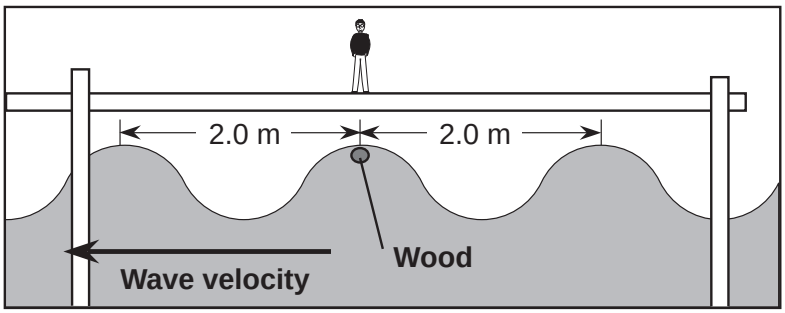
(Not drawn to scale)

Calculate the magnitude of the interplanetary force of attraction between Uranus and Neptune at this point. [Show all work, including the equation and substitution with units.] [2]

69 The magnitude of the force the Sun exerts on Uranus is 1.41×10^{21} newtons. Explain how it is possible for the Sun to exert a greater force on Uranus than Neptune exerts on Uranus. [1]

Base your answers to questions 70 and 71 on the information and diagram below.

A student standing on a dock observes a piece of wood floating on the water as shown below. As a water wave passes, the wood moves up and down, rising to the top of a wave crest every 5.0 seconds.



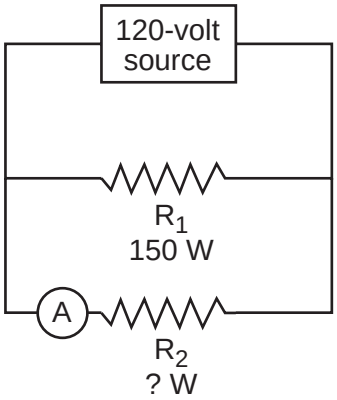
(Not drawn to scale)

70 Calculate the frequency of the passing water waves. [Show all work, including the equation and substitution with units.] [2]

71 Calculate the speed of the water waves. [Show all work, including the equation and substitution with units.] [2]

---

72 The diagram below shows two resistors, R_1 and R_2, connected in parallel in a circuit having a 120-volt power source. Resistor R_1 develops 150 watts and resistor R_2 develops an unknown power. Ammeter A in the circuit reads 0.50 ampere.



Calculate the amount of charge passing through resistor R_2 in 60. seconds. [Show all work, including the equation and substitution with units.] [2]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Thursday, June 22, 2006 — 9:15 a.m. to 12:15 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	44 .....
37	45 .....
38	46 .....
39	47 .....
40	48 .....
41	49 .....
42	50 .....
43	51 .....

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

PS/PHYSICS

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
PHYSICS

Thursday, June 22, 2006 — 9:15 a.m. to 12:15 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	16	
B–2	14	
C	20	

Total Written Test Score (Maximum Raw Score: 85)

Final Score (From Conversion Chart)

Raters' Initials:

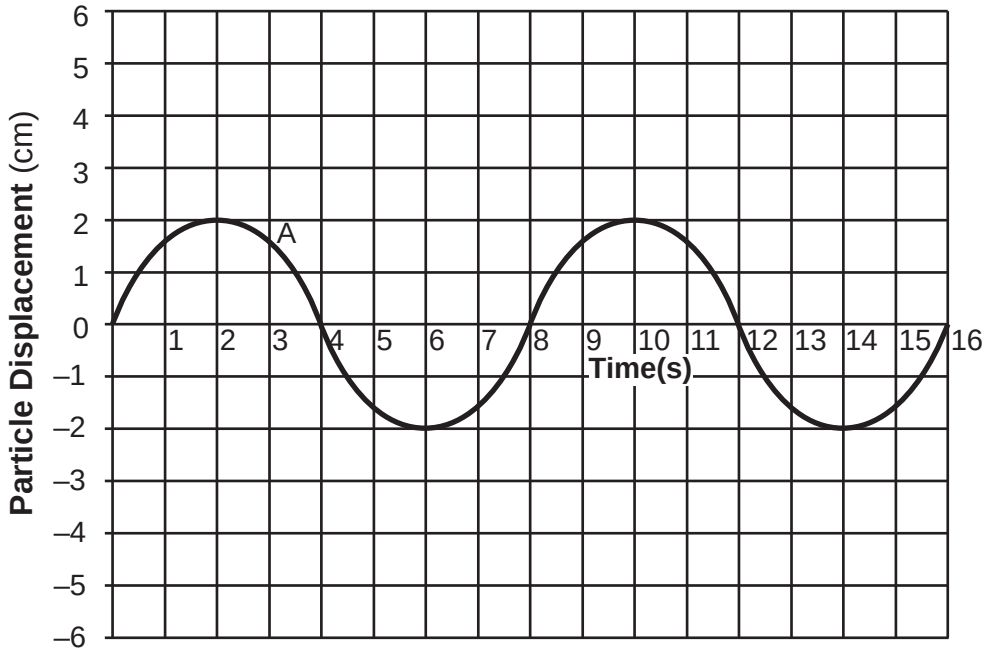
Rater 1 ..... **Rater 2** .....

Part B–2

52

53 _____

54



55 _____

_____

56

57 _____ **Hz**

58

59 _____ **m**

60

Part C

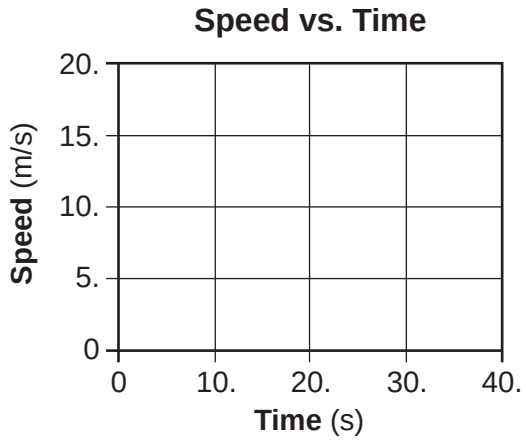
61

62

63 _____

64 _____ **m/s**

65



66

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72

FOR TEACHERS ONLY

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

PS–P

PHYSICAL SETTING/PHYSICS

Thursday, June 22, 2006 — 9:15 a.m. to 12:15 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. Check this web site http://www.emsc.nysed.gov/osa/ and select the link "Examination 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 . . . . **3**	13 . . . . **4**	25 . . . . **2**
2 . . . . **1**	14 . . . . **1**	26 . . . . **2**
3 . . . . **1**	15 . . . . **3**	27 . . . . **4**
4 . . . . **4**	16 . . . . **3**	28 . . . . **2**
5 . . . . **4**	17 . . . . **2**	29 . . . . **2**
6 . . . . **3**	18 . . . . **2**	30 . . . . **2**
7 . . . . **1**	19 . . . . **3**	31 . . . . **4**
8 . . . . **2**	20 . . . . **4**	32 . . . . **3**
9 . . . . **3**	21 . . . . **1**	33 . . . . **1**
10 . . . . **1**	22 . . . . **1**	34 . . . . **3**
11 . . . . **4**	23 . . . . **4**	35 . . . . **3**
12 . . . . **2**	24 . . . . **3**	

Part B–1

36 . . . . **2**	44 . . . . **1**
37 . . . . **1**	45 . . . . **3**
38 . . . . **4**	46 . . . . **2**
39 . . . . **1**	47 . . . . **3**
40 . . . . **1**	48 . . . . **2**
41 . . . . **4**	49 . . . . **3**
42 . . . . **2**	50 . . . . **1**
43 . . . . **4**	51 . . . . **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 Thursday, June 22, 2006. 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

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

Example of a 2-credit response:

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

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

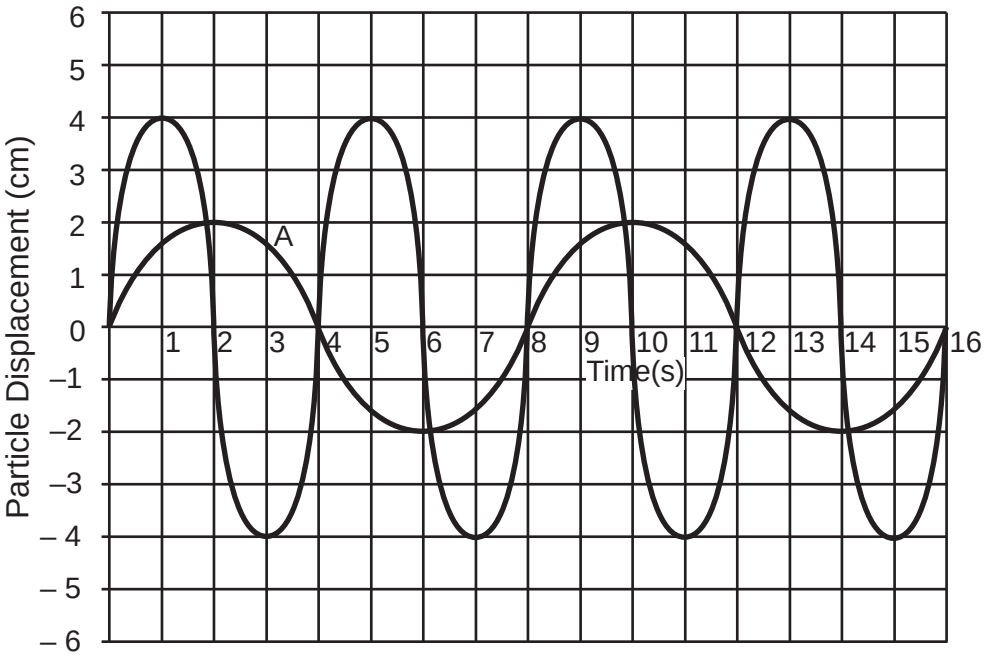
$$n_2 = \frac{1.33 \sin 45^\circ}{\sin 29^\circ}$$

$$n_2 = 1.94$$

53 Allow 1 credit for zircon. Allow credit for an answer that is consistent with the student's response to question 52.

54 Allow a maximum of 2 credits, 1 credit for correct amplitude and 1 credit for correct frequency.

Example of a 2-credit response:



Note: If more than one cycle is drawn, rate only the first cycle.

55 Allow 1 credit for explaining the difference between a scalar and a vector quantity. Acceptable responses include, but are not limited to:

— A scalar quantity has magnitude only. A vector quantity has both magnitude and direction.
— A vector quantity has direction.
— A scalar quantity has no direction.

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

Example of a 2-credit response:

$F_f = \mu F_N$

$F_f = (.15)(10.\ \text{kg})\left(9.81\ \text{m/s}^2\right)$

$F_f = 15\ \text{N}\ \ or\ \ 14.7\ \text{N}$

57 Allow 1 credit for 4.52×10^{14} Hz.

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

Examples of 2-credit responses:

$E = mc^2$

$E = 2(1.67 \times 10^{-27}\ \text{kg})(3.00 \times 10^{8}\ \text{m/s})^2$ *or* $\dfrac{1\ \text{u}}{931\ \text{MeV}} = \dfrac{2\ \text{u}}{x\ \text{MeV}}$

$x = 1860\ \text{MeV}$

$E = 3.01 \times 10^{-10}\ \text{J}$

59 Allow 1 credit for 8.0 m ± 0.2 m.

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

Example of a 2-credit response:

$$P = \frac{Fd}{t}$$

$$P = \frac{(50.\ \text{N})(8.0\ \text{m})}{3.0\ \text{s}}$$

$P = 130\ \text{W}$ *or* $133\ \text{W}$

Allow credit for an answer that is consistent with the student's response to question 59.

Part C

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

Example of a 2-credit response:

$\Delta PE = mg\Delta h$
$\Delta PE = (3.0\text{ kg})(9.81\text{ m/s}^2)(3.0\text{ m})$
$\Delta PE = 88\text{ J}$ *or* $88.3\text{ kg}\bullet\text{m}^2/\text{s}^2$

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

Example of a 2-credit response:

$E_T = PE + KE + Q$
$KE = mg\Delta h$
$KE = (3.0\text{ kg})(9.81\text{ m/s}^2)(3.0\text{ m} - 1.0\text{ m})$
$KE = 59\text{ J}$ *or* 58.9 J

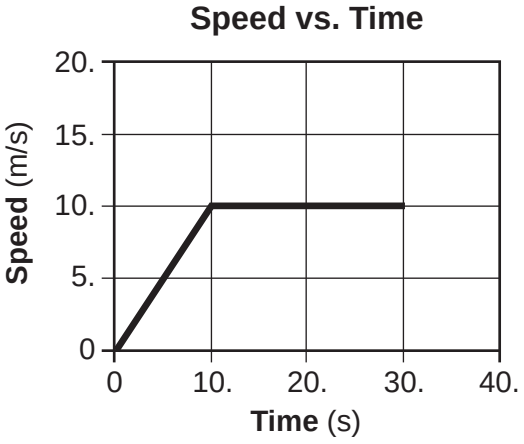
63 Allow 1 credit for G.

64 Allow 1 credit for 10. m/s.

65 Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for the line segment from 0 to 10. s.
- Allow 1 credit for the line segment from 10. to 30. s.
  Note: Do *not* penalize the student for extending the line past 30. s.

Example of a 2-credit response:



Allow credit for an answer that is consistent with the student's response to question 64.

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

Examples of 2-credit responses:

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

$d = 0 + \frac{1}{2}\left(1.0\ \text{m/s}^2\right)\left(10.\ \text{s}\right)^2$

$d = 50.\ \text{m}$

or

$d = \text{area} = \frac{1}{2}bh$

$d = \frac{1}{2}\left(10.\ \text{s}\right)\left(10.\ \text{m/s}\right)$

$d = 50.\ \text{m}$

67 Allow 1 credit for indicating that gravity is the fundamental force to which the author is referring.

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

Example of a 2-credit response:

$$F = \frac{G m_1 m_2}{r^2}$$

$$F = \frac{\left(6.67 \times 10^{-11}\ \text{N} \bullet \text{m}^2/\text{kg}^2\right)\left(8.73 \times 10^{25}\ \text{kg}\right)\left(1.03 \times 10^{26}\ \text{kg}\right)}{\left(1.63 \times 10^{12}\ \text{m}\right)^2}$$

$$F = 2.26 \times 10^{17}\ \text{N}$$

69 Allow 1 credit for indicating that the Sun is larger in mass.

Note: Do *not* allow credit for just "larger."

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

Example of a 2-credit response:

$$T = \frac{1}{f}$$

$$f = \frac{1}{T}$$

$$f = \frac{1}{5.0\ \text{s}}$$

$$f = 0.20\ \text{Hz}$$

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

Examples of 2-credit responses:

$$v = f\lambda$$
$$v = (0.20\ \text{Hz})(2.0\ \text{m})$$
$$v = 0.40\ \text{m/s}$$

or

$$\bar{v} = \frac{d}{t}$$
$$\bar{v} = \frac{2.0\ \text{m}}{5.0\ \text{s}}$$
$$\bar{v} = 0.40\ \text{m/s}$$

Allow credit for an answer that is consistent with the student's response to question 70.

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

Example of a 2-credit response:

$$I = \frac{\Delta q}{t}$$

$$\Delta q = It$$

$$\Delta q = (0.50\ \text{A})(60.\ \text{s})$$

$$\Delta q = 30.\ \text{C}$$

Regents Examination in Physical Setting/Physics

June 2006

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

The *Chart for Determining the Final Examination Score for the June 2006 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, June 22, 2006. 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.

Submitting 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 www.emsc.nysed.gov/osa/exameval.
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 2006 Physical Setting/Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	1,2,4,8,9,12,13,16,18,19, 22,23,30	37,38,40,42,48,52,57, 58,60	61,62,64,68,69,70, 71,72
Math Key Idea 2			63
Math Key Idea 3		47	
Sci. Inq. Key Idea 1			
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3		44,45,51,53,55,59	
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1			67
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			
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		43	
4.3		46,49,54	
5.1		39,56	65,66
5.3		50	
Standard 4			
4.1	12,13,14,15,16,17,18,19, 20,21,22,23,24	43,45,60	61,62,63,72
4.3	25,27,28,29,30,31,32,33	46,48,49,52,53,54	70,71
5.1	1,2,3,4,5,6,7,8,9,10,11,26	37,38,39,40,41,42,44, 47,55,56,59	64,65,66,68,69
5.3	34,35	50,51,57,58	67

University of the State of New York
State Education Department

Regents Examination in Physical Setting/Physics
June 2006

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

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	63	80	41	58	19	32
84	99	62	79	40	57	18	30
83	98	61	78	39	56	17	29
82	97	60	77	38	55	16	28
81	96	59	76	37	54	15	26
80	95	58	75	36	53	14	25
79	94	57	74	35	52	13	23
78	93	56	73	34	51	12	22
77	92	55	72	33	49	11	20
76	91	54	71	32	48	10	19
75	90	53	70	31	47	9	17
74	89	52	69	30	46	8	15
73	89	51	68	29	45	7	14
72	88	50	67	28	43	6	12
71	87	49	66	27	42	5	10
70	86	48	66	26	41	4	8
69	85	47	65	25	40	3	6
68	84	46	63	24	39	2	4
67	83	45	62	23	37	1	2
66	82	44	61	22	36	0	0
65	81	43	60	21	35		
64	81	42	59	20	33		

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 scaled score that corresponds to that raw score. The scaled score is the student's final examination score. Enter this score in the space labeled "Final Score" on the student's answer sheet.

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. The chart above is usable only for this administration of the Physical Setting/Physics Examination.