FOR TEACHERS ONLY

PS–P

PHYSICAL SETTING/PHYSICS

Thursday, January 27, 2005 — 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. 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						Part B–1			
(1)	**2**	(13)	**3**	(25)	**2**	(36)	**1**	(43)	**3**
(2)	**1**	(14)	**2**	(26)	**2**	(37)	**2**	(44)	**1**
(3)	**1**	(15)	**4**	(27)	**2**	(38)	**2**	(45)	**2**
(4)	**2**	(16)	**4**	(28)	**4**	(39)	**1**	(46)	**3**
(5)	**3**	(17)	**1**	(29)	**1**	(40)	**4**	(47)	**4**
(6)	**4**	(18)	**3**	(30)	**3**	(41)	**3**	(48)	**4**
(7)	**1**	(19)	**1**	(31)	**4**	(42)	**1**		
(8)	**4**	(20)	**2**	(32)	**3**				
(9)	**3**	(21)	**2**	(33)	**1**				
(10)	**3**	(22)	**1**	(34)	**2**				
(11)	**4**	(23)	**4**	(35)	**3**				
(12)	**1**	(24)	**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 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, January 27, 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

49 Allow 1 credit for indicating that the components are equal. Acceptable responses include, but are not limited to:

— The horizontal velocities at *A* and *B* are the same.
— The horizontal component is constant.
— the same

50 Allow 1 credit for indicating that the magnitude of the vertical component at *B* is greater. Acceptable responses include, but are not limited to:

— Velocity (or vertical velocity) at *A* is less than at *B*.
— Velocity (or vertical velocity) at *B* is greater than at *A*.
— less

51 Allow 1 credit for sketching a smooth curve that starts at the same point as the ideal path and lands at a distance less than that of the ideal path.

Example of an Acceptable Response
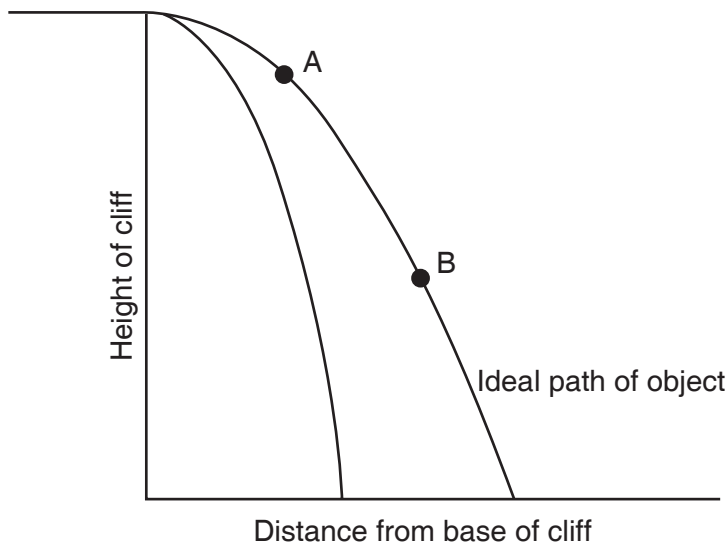
52 Allow 1 credit for 9.0 N ±0.6 N.

53 Allow 1 credit for 3.0 N or an answer that is consistent with the student's response to question 52.

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

Examples of Acceptable Responses

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

$$a = \frac{3.0 \text{ N}}{4.0 \text{ kg}}$$

$$a = 0.75 \text{ m/s}^2$$

or

$$a = \frac{F_1 - F_2}{m}$$

$$a = \frac{12.0 \text{ N} - 9.0 \text{ N}}{4.0 \text{ kg}}$$

$$a = 0.75 \text{ m/s}^2$$

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

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

Example of an Acceptable Response

$F_f = \mu F_N$
$F_f = (0.200)\,(780.\ \text{N})$
$F_f = 156\ \text{N}$

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

Example of an Acceptable Response

$$E = \frac{hc}{\lambda}$$

$$E = \frac{\left(6.63 \times 10^{-34}\ \text{J} \cdot \text{s}\right)\left(3.00 \times 10^{8}\ \text{m/s}\right)}{9.00 \times 10^{-10}\ \text{m}}$$

$$E = 2.21 \times 10^{-16}\ \text{J}$$

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

Example of an Acceptable Response

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

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

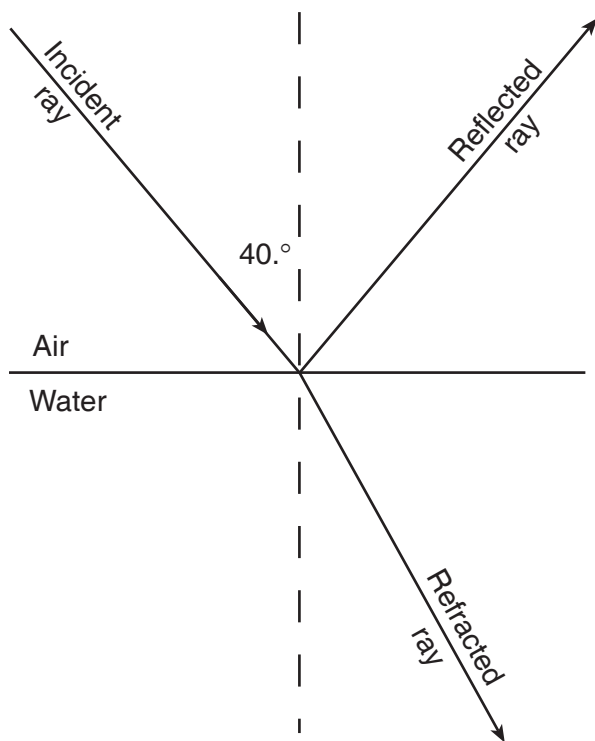$$\sin \theta_2 = \frac{(1.00)(\sin 40.^\circ)}{1.33}$$

$$\sin \theta_2 = 0.483$$

$$\theta_2 = 29^\circ \quad or \quad 28.9^\circ$$

58 Allow 1 credit for correctly drawing and labeling the refracted ray at an angle of 29° ±2°. Allow credit for an answer that is consistent with the student's response to question 57.

59 Allow 1 credit for correctly drawing and labeling the reflected ray at an angle of 40.° ±2°.

58–59 Example of an Acceptable Response

Note: Deduct no more than 1 credit for missing or incorrect labels.

60 Allow 1 credit for indicating that the quantity represented by the slope of each line is the spring constant.

61 Allow 1 credit for indicating that the potential energy stored in spring *A* is less. Acceptable responses include, but are not limited to:

— The potential energy stored in spring *A* is less than the potential energy stored in spring *B*.
— Potential energy in *A* is less.
— Potential energy in *B* is more.
— less

Part C

62 Allow 1 credit for drawing the path of the rubber stopper if the string breaks at the position shown, showing a straight line tangent to the circle going up from the stopper, even if there is *no* arrowhead on the line.

Example of an Acceptable Response

Top View
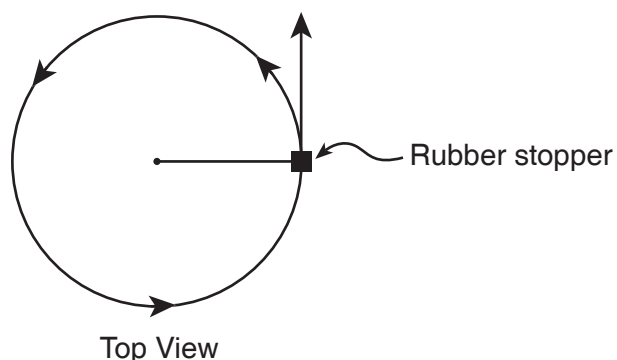
63 Allow 1 credit for describing what would happen to the radius of the circle if the student whirls the stopper at a greater speed. Acceptable responses include, but are not limited to:

— As the speed of the stopper is increased, the radius of the orbit will increase.
— gets bigger *or* gets larger
— *R* gets bigger
— increases

Example of an *Unacceptable* Response

— It gets 4 times as big.

64 Allow a maximum of 3 credits, 1 credit for each of three measurements that must be taken to show that the magnitude of the centripetal force is equal to the balancing weights. Acceptable responses include, but are not limited to:

— mass of stopper
— radius of path
— velocity of stopper *or* frequency *or* period
— weight of the balancing weights

65 Allow a maximum of 2 credits, allocated as follows:
  • Allow 1 credit for drawing and labeling the vector representing the weight.
  • Allow 1 credit for drawing and labeling the vector representing the centripetal force.

Note: Deduct no more than 1 credit for missing arrowheads and/or labels.

Example of an Acceptable Response

Vertical Circle (side view)
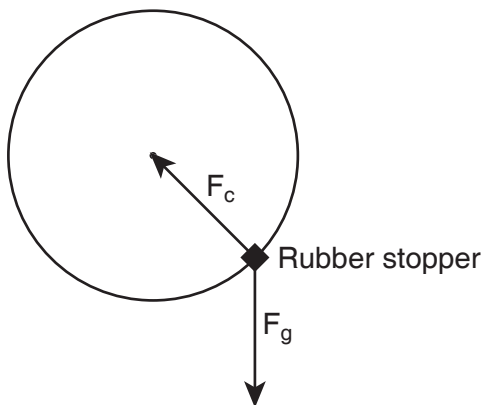
66 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of an Acceptable Response

$p_{\text{before}} = p_{\text{after}}$
$m_1\, v_{1i} + m_2\, v_{2i} = (m_1 + m_2)\, v_f$
$(1000.\ \text{kg})\,(6.0\ \text{m/s}) + (5000.\ \text{kg})\,(0.0\ \text{m/s}) = (1000.\ \text{kg} + 5000.\ \text{kg})\, v_f$
$6000\ \text{kg} \cdot \text{m/s} = (6000.\ \text{kg})\, v_f$
$v_f = 1.0\ \text{m/s}$

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

Example of an Acceptable Response

$KE = \frac{1}{2} mv^2$
$KE = \frac{1}{2}(6000.\ \text{kg})\,(1.0\ \text{m/s})^2$
$KE = 3000\ \text{J}\ or\ 3.0 \times 10^3\ \text{J}$

Allow credit for an answer that is consistent with the student's response to question 66.

68 Allow 1 credit for stating how the kinetic energy of the combined carts after the collision compares to the kinetic energy of the carts before the collision. Acceptable responses include, but are not limited to:

— The *KE* of the combined carts after the collision is less than the *KE* of the carts before the collision.
— less
— $KE_{before} > KE_{after}$

69 Allow 1 credit for marking a scale that is linear and has appropriate divisions.

70 Allow 1 credit for plotting all points accurately (±0.3 grid space). Allow credit if the student correctly uses his or her response to question 69.

71 Allow 1 credit for drawing the best-fit line. Allow credit if the student correctly uses his or her response to question 70.

69–71 **Example of a 3-Credit Response**

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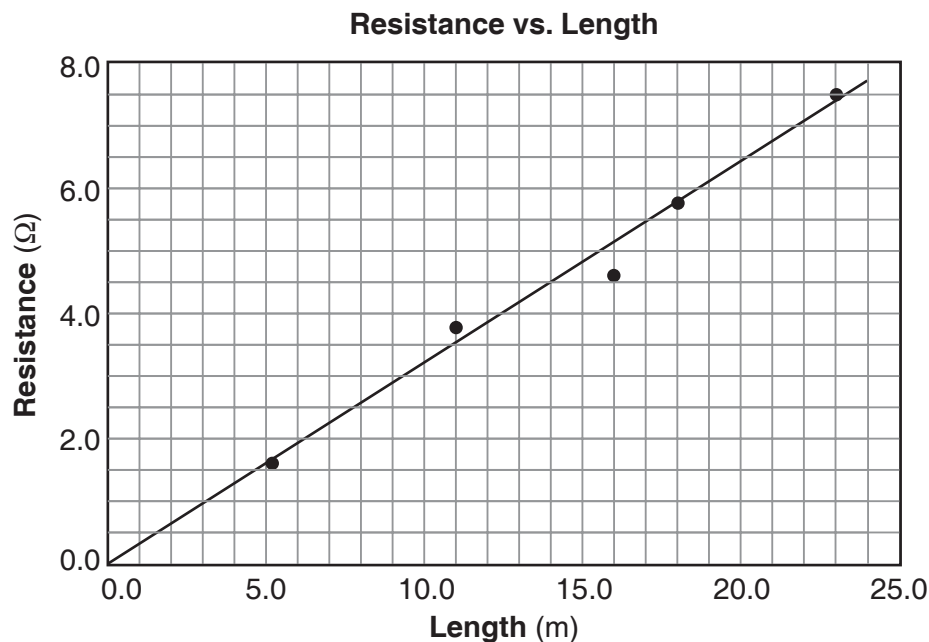
72 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 2-Credit Response

$$\text{Slope} = \frac{\Delta y}{\Delta x} \qquad or \qquad \text{slope} = \frac{\Delta \text{ resistance}}{\Delta \text{ length}}$$
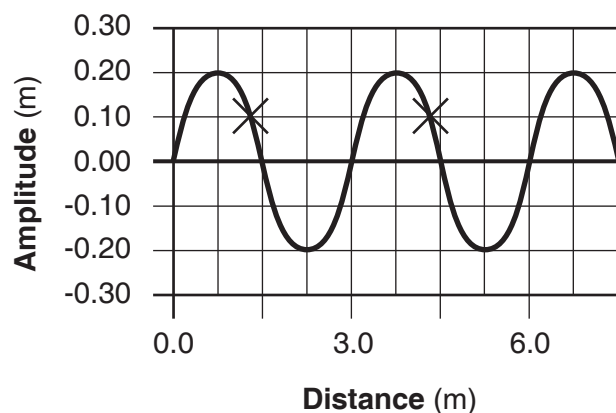
$$\text{Slope} = \frac{4.5\ \Omega - 0.0\ \Omega}{14.0\ \text{m} - 0.0\ \text{m}}$$

$$\text{Slope} = 0.32\ \Omega/\text{m}$$

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

73 Allow 1 credit for marking any two points on the wave that are in phase with each other.

Example of an Acceptable Response

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

Examples of 2 Credit Responses

$$v = f\lambda$$
$$T = \frac{1}{f}$$
$$T = \frac{\lambda}{v}$$
$$T = \frac{3.0\ \text{m}}{4.0\ \text{m/s}}$$
$$T = 0.75\ \text{s}$$

or

$$v = f\lambda$$
$$4.0\ \text{m/s} = f(3.0\ \text{m})$$
$$f = 1.3\ \text{Hz}$$
$$T = \frac{1}{f}$$
$$T = \frac{1}{1.3\ \text{Hz}}$$
$$T = 0.77\ \text{s}$$

or

$$\bar{v} = \frac{d}{t}$$
$$t = \frac{d}{\bar{v}}$$
$$t = \frac{3.0\ \text{m}}{4.0\ \text{m/s}}$$
$$t = 0.75\ \text{s}$$

Regents Examination in Physical Setting/Physics

January 2005

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

The *Chart for Determining the Final Examination Score for the January 2005 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, January 27, 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

January 2005 Physical Setting/Physics			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1	1,2,3,4,20,21,24,25,26	39,40,47,53,54,55,56,57	66,67,69,70,71,74
Math Key Idea 2			
Math Key Idea 3		60,61	72
Sci. Inq. Key Idea 1			
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3		41,46	
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			
Key Idea 3		38	
Key Idea 4			63
Key Idea 5			68
Key Idea 6			
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
4.1		42	
4.3		48,58,59	73
5.1		36,37,49,50,51,52	62,64,65
5.3		43,44,45	
Standard 4			
4.1	20,21,22,23,24,25,26,27,28,29,30,31	42,46,47	67,68,69,70,71,72
4.3	10,11,12,13,14,15,16,17,18,19	41,48,57,58,59	73,74
5.1	1,2,3,4,5,6,7,8,9,32,33	36,37,40,49,50,51,52,53,54,55,60,61	62,63,64,65,66
5.3	34,35	43,44,45,56	