

FOR TEACHERS ONLY

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

PS-P

PHYSICAL SETTING/PHYSICS

Wednesday, June 13, 2012 — 1:15 to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

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

Part A and Part B-1

Allow 1 credit for each correct response.

| Part A | | | |
|------------------|------------------|------------------|------------------|
| 1 1 | 10 2 | 19 4 | 28 2 |
| 2 3 | 11 1 | 20 4 | 29 2 |
| 3 3 | 12 1 | 21 2 | 30 2 |
| 4 3 | 13 2 | 22 2 | 31 1 |
| 5 1 | 14 4 | 23 2 | 32 4 |
| 6 4 | 15 3 | 24 1 | 33 4 |
| 7 3 | 16 4 | 25 1 | 34 2 |
| 8 3 | 17 3 | 26 1 | 35 2 |
| 9 4 | 18 1 | 27 3 | |
| Part B-1 | | | |
| 36 2 | 40 3 | 44 3 | 48 1 |
| 37 3 | 41 3 | 45 2 | 49 4 |
| 38 3 | 42 4 | 46 2 | 50 3 |
| 39 4 | 43 1 | 47 1 | |

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Physical Setting/Physics examination. Additional information about scoring is provided in the publication *Information for Scoring Regents Examinations in the Sciences*.

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.

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

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper.

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

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

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet, and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw score on the written test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.p12.nysed.gov/apda/> on Wednesday, June 13, 2012. The student's scale score should be entered in the labeled box on the student's answer booklet. The scale score is the student's final examination score. On the front of the student's answer booklet, raters must enter their initials on the lines next to "Rater 1" or "Rater 2."

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

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

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

Scoring Criteria for Calculations

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

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

Part B–2

51 [1] Allow 1 credit for 20. N/m.

52 [1] Allow 1 credit for the equation and substitutions with units *or* for an answer that is consistent with the student's response to question 51. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$$PE_s = \text{Area} = \frac{1}{2}bh$$
$$PE_s = \frac{1}{2}(0.30 \text{ m})(6.00 \text{ N})$$

or

$$PE_s = \frac{1}{2}kx^2$$
$$PE_s = \frac{1}{2}(20. \text{ N/m})(0.30 \text{ m})^2$$

53 [1] Allow 1 credit for the correct answer with units *or* for an answer that is consistent with the student's response to question 52.

Example of a 1-credit response:

$$PE_s = 0.90 \text{ J}$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 52–53.

- 54 [1] Allow 1 credit for the equation and substitutions with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$$\begin{array}{l}
 F_{net} t = \Delta p \\
 t = \frac{\Delta p}{F_{net}} \\
 t = \frac{(1200. \text{ kg})(-10. \text{ m/s})}{-6000. \text{ N}}
 \end{array}
 \quad \text{or} \quad
 \begin{array}{l}
 F = ma \\
 a = \frac{F}{m} \\
 a = \frac{6000. \text{ N}}{1200 \text{ kg}} \\
 a = 5 \text{ m/s}^2 \\
 a = \frac{\Delta v}{t} \\
 t = \frac{\Delta v}{a} \\
 t = \frac{10 \text{ m/s}}{5 \text{ m/s}^2}
 \end{array}$$

Note: Δp , F_{net} , and Δv must be in the same sign.

- 55 [1] Allow 1 credit for the correct answer with units *or* for an answer that is consistent with the student's response to question 54.

Example of a 1-credit response:

$$t = 2.0 \text{ s}$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 54–55.

- 56 [1] Allow 1 credit for stating that the total horizontal distance would decrease.

- 57 [1] Allow 1 credit for stating that the time in the air would increase.

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

Example of a 1-credit response:

$$\begin{array}{l}
 F_g = \frac{Gm_1m_2}{r^2} \\
 F_g = \frac{(6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2)(5.98 \times 10^{24} \text{ kg})(7.35 \times 10^{22} \text{ kg})}{(3.84 \times 10^8 \text{ m})^2}
 \end{array}$$

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

Example of a 1-credit response:

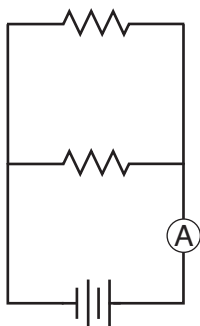
$$F_g = 1.99 \times 10^{20} \text{ N}$$

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

- 60 [1] Allow 1 credit for drawing a parallel circuit containing two resistors *or* lamps and a battery *or* a cell.

- 61 [1] Allow 1 credit for correct placement of the ammeter.

Example of a 2-credit response for questions 60–61:



- 62 [1] Allow 1 credit for the equation and substitutions with units *or* for an answer that is consistent with the student's response to question 60. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$
$$\frac{1}{R_{eq}} = \frac{1}{15 \Omega} + \frac{1}{20. \Omega}$$

- 63 [1] Allow 1 credit for the correct answer with units *or* for an answer that is consistent with the student's response to question 62.

Example of a 1-credit response:

$$R_{eq} = 8.6 \Omega$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 62–63.

- 64 [1] Allow 1 credit for 3.2 m.

- 65 [1] Allow 1 credit for 0.60 m.

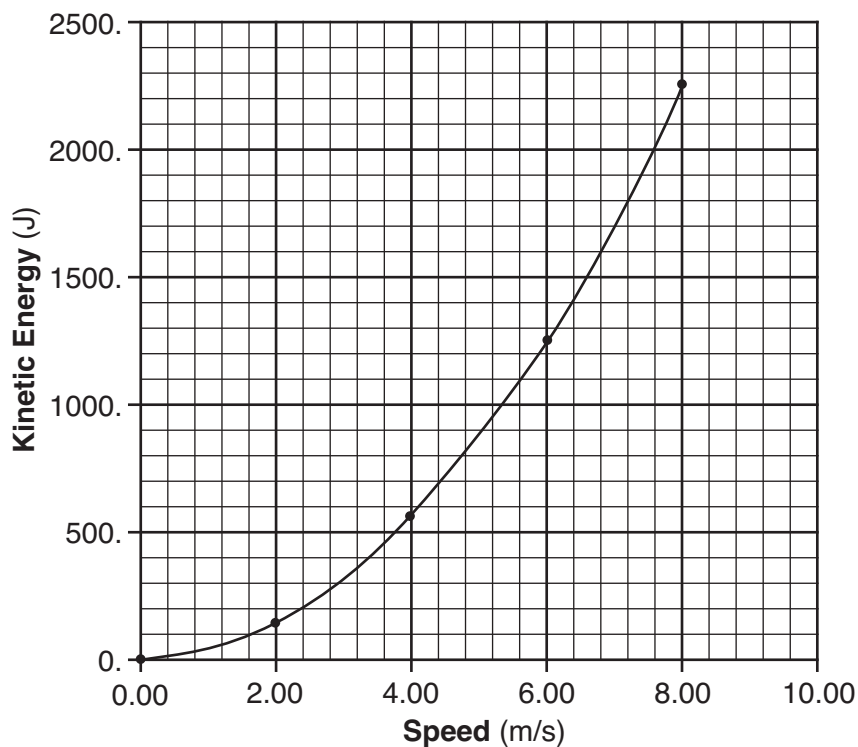
Part C

66 [1] Allow 1 credit for correctly plotting all points ± 0.3 grid space.

67 [1] Allow 1 credit for drawing the line or curve of best fit.

Example of a 2-credit graph for questions 66 and 67:

Kinetic Energy vs. Speed



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

68 [1] Allow 1 credit for the equation and substitutions with units *or* for an answer that is consistent with the student's response to question 67. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

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

$$m = \frac{2 KE}{v^2}$$

$$m = \frac{2(140. \text{ J})}{(2.00 \text{ m/s})^2}$$

- 69** [1] Allow 1 credit for the correct answer with units *or* for an answer consistent with the student's response to question 67 and/or 68.

Example of a 1-credit response:

$$70.0 \text{ kg}$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 68–69.

- 70** [1] Allow 1 credit for indicating that the less massive soccer player has less kinetic energy.

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

Example of a 1-credit response:

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

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

$$t = \frac{75 \text{ m}}{3.0 \text{ m/s}}$$

- 72** [1] Allow 1 credit for the correct answer with units *or* for an answer consistent with the student's response to question 71.

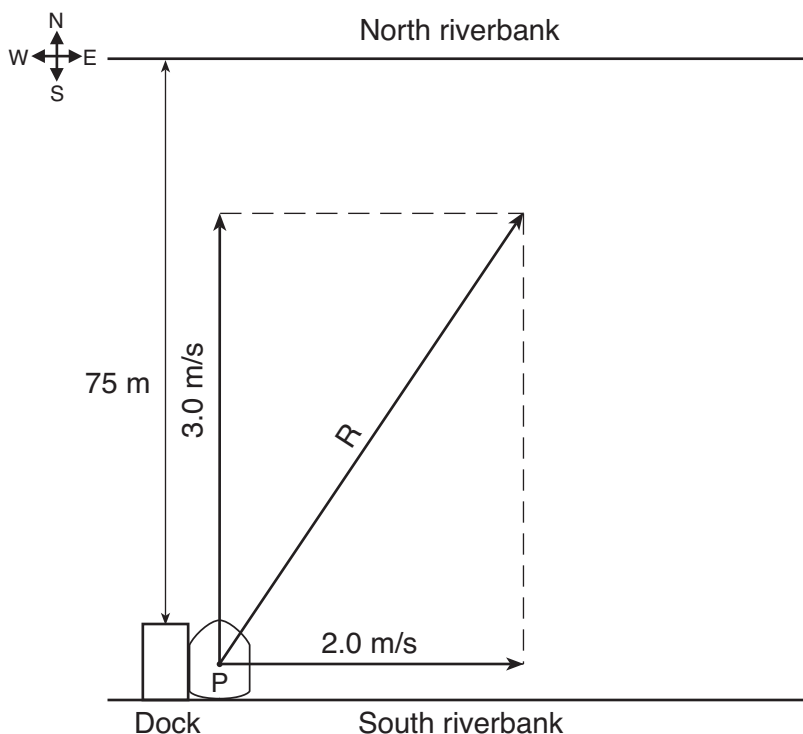
Example of a 1-credit response:

$$t = 25 \text{ s}$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 71–72.

- 73 [1] Allow 1 credit for a vector 4.0 cm \pm 0.2 cm long, directed to the east. Do *not* allow credit if the arrowhead is missing *or* if the arrowhead is pointing in the wrong direction.

Example of a 1-credit response for question 73 and a 1-credit response for question 74:



Note: Allow credit even if the vector does *not* start at point *P*.
The graphical solution for the resultant, *R*, shown above, represents the graphical response to question 74.

- 74 [1] Allow 1 credit for the equation and substitutions with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$$c^2 = a^2 + b^2$$

$$c^2 = (3.0 \text{ m/s})^2 + (2.0 \text{ m/s})^2 \quad \text{or}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan \theta = \frac{3.0 \text{ m/s}}{2.0 \text{ m/s}}$$

$$\theta = 56^\circ$$

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{hypotenuse} = \frac{3.0 \text{ m/s}}{\sin 56^\circ}$$

or

For a graphic response, allow 1 credit for constructing a vector diagram in the student answer space for question 73, with a resultant vector 7.2 cm \pm 0.2 cm long *or* for an answer that is consistent with the student's response to question 73. To receive this credit, the arrowheads must be correctly drawn.

- 75** [1] Allow 1 credit for the correct answer with units *or* for an answer that is consistent with the student's response to question 73 and/or 74.

Examples of 1-credit responses:

$$c = 3.6 \text{ m/s} \quad \text{or} \quad \text{hypotenuse} = 3.6 \text{ m/s} \quad \text{or} \quad R = 3.6 \text{ m/s}$$

or

For a graphic response, allow 1 credit for $3.6 \text{ m/s} \pm 0.1 \text{ m/s}$.

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 74–75.

- 76** [1] Allow 1 credit for $37^\circ \pm 2^\circ$.

- 77** [1] Allow 1 credit for the equation and substitutions with units *or* for an answer that is consistent with the student's response to question 76. Refer to *Scoring Criteria for Calculations* in this rating guide.

Example of a 1-credit response:

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

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

$$\sin \theta_1 = \frac{1.66 \sin 37^\circ}{1.33}$$

- 78** [1] Allow 1 credit for the correct answer with units *or* for an answer consistent with the student's response to question 77.

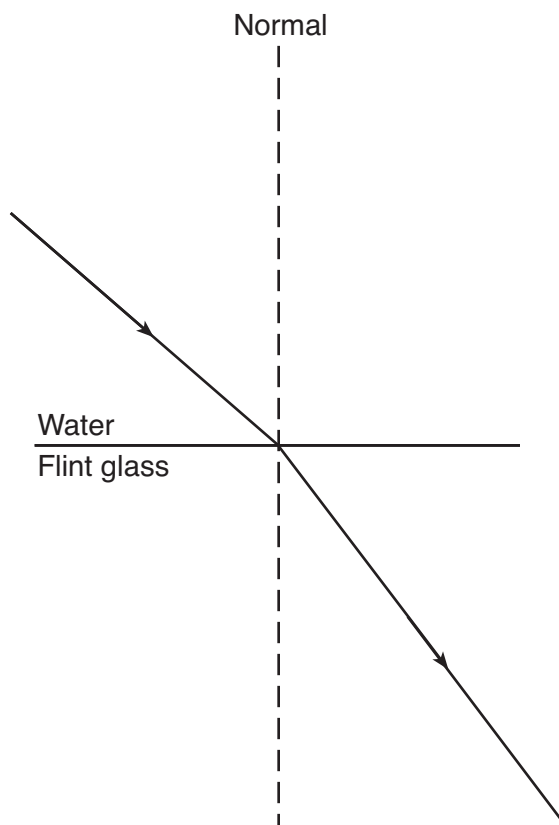
Example of a 1-credit response:

$$\theta_1 = 49^\circ$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 77–78.

79 [1] Allow 1 credit for drawing the incident ray at an angle of incidence of $49^\circ \pm 2^\circ$.

Example of a 1-credit response:



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

80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

- reflection
- absorption
- The speed of the wave decreases upon entering the flint glass.
- wavelength decreases

81 [1] Allow 1 credit for up, down, down.

82 [1] Allow 1 credit for $-1e$. Do *not* allow credit if the negative sign is missing.

83 [1] Allow 1 credit for 1.60×10^{-7} J.

- 84 [1] Allow 1 credit for the equation and substitutions with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

Examples of 1-credit responses:

$$\begin{array}{lll}
 E = mc^2 & & (m_p) \text{ mass of proton} \\
 m = \frac{E}{c^2} & \text{or} & (m_{\bar{p}}) \text{ mass of antiproton} \\
 & & E = mc^2 \\
 & & m = \frac{E}{c^2} \\
 m = \frac{2(1.60 \times 10^{-7} \text{ J})}{(3.00 \times 10^8 \text{ m/s})^2} & & m_{total} = m + m_p + m_{\bar{p}} \\
 & & m_{total} = \frac{E}{c^2} + m_p + m_{\bar{p}} \\
 & & m_{total} = \frac{2(1.60 \times 10^{-7} \text{ J})}{(3.00 \times 10^8 \text{ m/s})^2} + 1.67 \times 10^{-27} \text{ kg} + 1.67 \times 10^{-27} \text{ kg}
 \end{array}$$

- 85 [1] Allow 1 credit for the correct answer with units *or* for an answer consistent with the student's response to question 84.

Examples of 1-credit responses:

$$m = 3.56 \times 10^{-24} \text{ kg} \quad \text{or} \quad m_{total} = 3.56 \times 10^{-24} \text{ kg}$$

Note: Do *not* penalize the student more than 1 credit for errors in units in questions 84–85.

Regents Examination in Physical Setting/Physics

June 2012

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

The *Chart for Determining the Final Examination Score for the June 2012 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site at: <http://www.p12.nysed.gov/apda/> on Wednesday, June 13, 2012. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Physics must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

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

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

Map to Core Curriculum

| June 2012 Physical Setting/Physics | | | |
|-------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|
| Question Numbers | | | |
| Key Ideas | Part A | Part B | Part C |
| Standard 1 | | | |
| Math Key Idea 1 | 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 17, 18, 19, 26, 27, 28, 31, 34 | 37, 38, 40, 41, 50, 51, 52, 53, 54, 55, 58, 59, 62, 63, 64, 65 | 66, 67, 68, 69, 71, 72, 73, 74, 75, 76, 77, 78, 81, 82, 83, 84, 85 |
| Math Key Idea 2 | | 47, 49, 56, 57 | 70 |
| Math Key Idea 3 | 20, 21 | 39, 42, 43, 51, 52, 53 | 81, 82 |
| Sci. Inq. Key Idea 1 | | 45 | |
| Sci. Inq. Key Idea 2 | | | |
| Sci. Inq. Key Idea 3 | | 48, 60, 61 | 81, 82 |
| Eng. Des. Key Idea 1 | | | |
| Standard 2 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | | |
| Standard 6 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | 30 | | |
| Key Idea 3 | | 36 | 83 |
| Key Idea 4 | | | |
| Key Idea 5 | | | |
| Key Idea 6 | | | |
| Standard 7 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | | |
| Standard 4 Process Skills | | | |
| 4.1 | | 40, 50, 52, 53, 60, 61 | |
| 4.3 | | 46, 49 | 77, 78, 79, 80 |
| 5.1 | 1, 3, 12 | 38, 51 | 73, 74, 75 |
| 5.3 | | 44 | |
| Standard 4 | | | |
| 4.1 | 14, 15, 17, 19, 20, 22, 25, 26, 30 | 39, 40, 41, 43, 50, 52, 53, 60, 61, 62, 63 | 66, 67, 68, 69, 70 |
| 4.3 | 21, 24, 29, 31, 32, 33, 34, 35 | 46, 49, 64, 65 | 76, 77, 78, 79, 80 |
| 5.1 | 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 18, 23, 28 | 37, 38, 42, 45, 47, 48, 51, 54, 55, 56, 57, 58, 59 | 71, 72, 73, 74, 75 |
| 5.3 | 4, 27 | 44 | 81, 82, 83, 84, 85 |