

# FOR TEACHERS ONLY

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

# PS–P

## PHYSICAL SETTING/PHYSICS

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

### SCORING KEY AND RATING GUIDE

**Directions to the Teacher:**

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

**Part A and Part B–1**

**Allow 1 credit for each correct response.**

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

## Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Physical Setting/Physics examination. Additional information about scoring is provided in the publication *Information for Scoring Regents Examinations in the Sciences*, which may be found on the Department web site at <http://www.p12.nysed.gov/assessment/science/science-hs.html>.

**Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.**

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

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper. Teachers may not score their own students' answer papers.

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

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

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet, and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw score on the written test should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Wednesday, June 17, 2015. The student's scale score should be entered in the labeled box on the student's answer booklet. The scale score is the student's final examination score. On the front of the student's answer booklet, raters must enter their initials on the lines next to "Rater 1" or "Rater 2."

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

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

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

### **Scoring Criteria for Calculations**

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

- Allow 1 credit for the equation and substitution of values with units. If the equation and/or substitution with units is not shown, do *not* allow this credit. Allow credit if the student has listed the values with units and written a correct equation.
  - Allow 1 credit for the correct answer (number and unit). If the number is given without the unit, allow credit if the credit for units was previously deducted for this calculation problem.
  - Penalize a student only once per calculation problem for incorrect or omitted units.
  - Allow credit if the answer is not expressed with the correct number of significant figures.
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## Part B–2

- 51 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Example of a 1-credit response:**

$$P = F\bar{v}$$

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

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

**Example of a 1-credit response:**

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

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

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

**Example of a 1-credit response:**

$$v = f\lambda$$

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

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

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

**Example of a 1-credit response:**

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

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

- 55 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 1-credit responses:**

$$E = mc^2$$

$$1 \text{ u} = 931 \text{ MeV}$$

or

$$E = (1.67 \times 10^{-27} \text{ kg})(3.00 \times 10^8 \text{ m/s})^2$$

$$\frac{1 \text{ eV}}{1.60 \times 10^{-19} \text{ J}} = \frac{9.31 \times 10^8 \text{ eV}}{E}$$

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

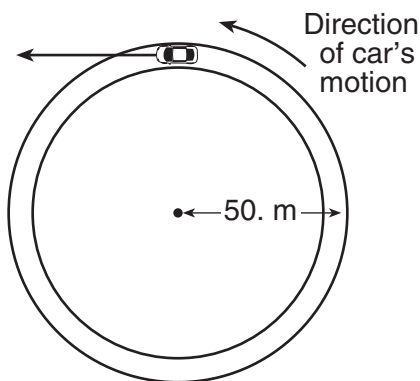
**Example of a 1-credit response:**

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

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

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

**Example of a 1-credit response:**



**Track, as Viewed from Above**

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

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

**Example of a 1-credit response:**

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

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

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

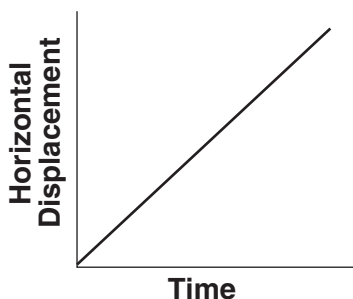
**Example of a 1-credit response:**

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

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

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

**Example of a 1-credit response:**



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

- 61 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 1-credit responses:**

$$a = \frac{\Delta v}{t} \qquad a = \frac{\Delta v}{t} \qquad a = \frac{\Delta v}{t} \qquad d = v_i t + \frac{1}{2} at^2$$

$$t = \frac{\Delta v}{a} \qquad \text{or} \qquad t = \frac{\Delta v}{a} \qquad \text{or} \qquad t = \frac{\Delta v}{a} \qquad \text{or}$$

$$t = \frac{15.0 \text{ m/s}}{9.81 \text{ m/s}^2} \qquad t = \frac{-7.5 \text{ m/s} - (+7.5 \text{ m/s})}{-9.81 \text{ m/s}^2} \qquad t = \frac{-7.5 \text{ m/s}}{-9.81 \text{ m/s}^2} \qquad 0 \text{ m} = (7.5 \text{ m/s})t + \frac{1}{2}(-9.8 \text{ m/s}^2)t^2$$

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

**Example of a 1-credit response:**

$$t = 1.5 \text{ s}$$

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

63 [1] Allow 1 credit for  $56^\circ \pm 2^\circ$ .

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

**Example of a 1-credit response:**

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

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

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

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

**Example of a 1-credit response:**

$$n_1 = 1.7 \quad \text{or} \quad 1.6$$

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

## Part C

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

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

**Example of a 1-credit response:**

$$F_f = \mu F_N$$

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

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

**Example of a 1-credit response:**

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

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

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

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

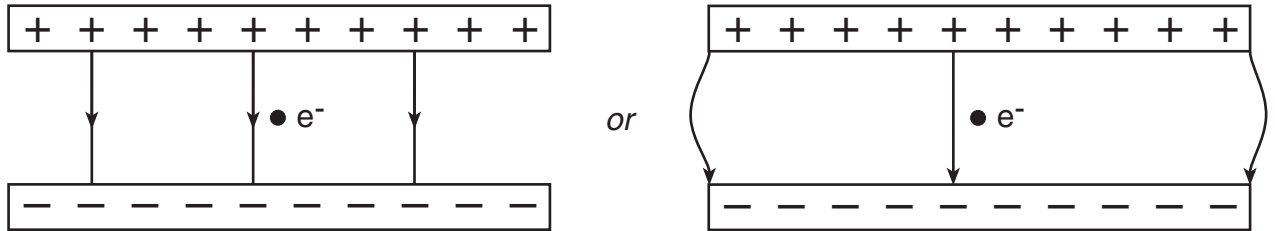
- The magnitude of the velocity increases.
- The block speeds up

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



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

**Examples of 1-credit responses:**



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

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

- toward the positive plate
- toward the top of the page
- opposite the direction of the field

- 73 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 1-credit responses:**

$$E = \frac{F_e}{q}$$

$$E = \frac{V}{d}$$

or

$$E = \frac{3.8 \times 10^{-16} \text{ N}}{1.60 \times 10^{-19} \text{ C}}$$

$$E = \frac{12 \text{ V}}{5.0 \times 10^{-3} \text{ m}}$$

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

**Example of a 1-credit response:**

$$E = 2.4 \times 10^3 \text{ N/C} \quad \text{or} \quad 2.3 \times 10^3 \text{ N/C}$$

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

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

- The force will remain constant.
- The force doesn't change.

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

77 [1] Allow 1 credit for  $4.90 \times 10^{-19} \text{ J}$  or  $4.89 \times 10^{-19} \text{ J}$

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

**Example of a 1-credit response:**

$$E_{\text{photon}} = hf$$

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

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

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

**Example of a 1-credit response:**

$$f = 7.39 \times 10^{14} \text{ Hz} \quad \text{or} \quad 7.38 \times 10^{14} \text{ Hz}$$

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

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

- visible light
- violet

- 81 [1] Allow 1 credit for the equation and substitution with units. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 1-credit responses:**

$$\begin{array}{l} P = \frac{V^2}{R} \\ R = \frac{V^2}{P} \\ R = \frac{(120. \text{ V})^2}{40. \text{ W}} \end{array} \quad \text{or} \quad \begin{array}{l} R = \frac{V}{I} \\ R = \frac{120. \text{ V}}{0.33 \text{ A}} \end{array}$$

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

**Example of a 1-credit response:**

$$R = 360 \Omega$$

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

- 83 [1] Allow 1 credit for indicating that there would be no change in the power dissipated.
- 84 [1] Allow 1 credit for indicating that the equivalent resistance would increase.
- 85 [1] Allow 1 credit for indicating that the equivalent resistance of the series circuit would be greater than the equivalent resistance of the parallel circuit.

## Regents Examination in Physical Setting/Physics

June 2015

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

**The *Chart for Determining the Final Examination Score for the June 2015 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Wednesday, June 17, 2015. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Physics must NOT be used to determine students' final scores for this administration.**

### Online Submission of Teacher Evaluations of the Test to the Department

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

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

## Map to Core Curriculum

<b>June 2015 Physical Setting/Physics</b>			
<b>Question Numbers</b>			
Key Ideas	Part A	Part B	Part C
<b>Standard 1</b>			
Math Key Idea 1	2, 3, 6, 7, 10, 13, 16, 17, 18, 30, 31	37, 39, 40, 44, 45, 46, 47, 48, 53, 54, 55, 56, 58, 59, 60, 64, 65	66, 67, 68, 72, 73, 74, 75, 77, 78, 79, 81, 82
Math Key Idea 2	24	43, 48	
Math Key Idea 3		61, 62	
Science Inquiry Key Idea 1			
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3	22, 34		
Engineering Design Key Idea 1			
<b>Standard 2</b>			
Key Idea 1			
Key Idea 2			
<b>Standard 6</b>			
Key Idea 1			
Key Idea 2			80, 84
Key Idea 3		36	
Key Idea 4			
Key Idea 5			
Key Idea 6			
<b>Standard 7</b>			
Key Idea 1			
Key Idea 2			
<b>Standard 4 Process Skills</b>			
4.1	13	43, 51, 52	83, 85
4.3		46, 63, 64, 65	
5.1	3	37, 38, 41, 58, 59	69, 70
5.3			76
<b>Standard 4</b>			
4.1	13, 14, 15, 16, 17, 18, 19	42, 43, 44, 45, 48, 51, 52	81, 82, 83, 84, 85
4.3	8, 20, 21, 23, 24, 25, 26, 27, 28, 32, 34, 35	46, 49, 53, 54, 63, 64, 65	80
5.1	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 22, 30, 33	36, 37, 38, 39, 40, 41, 57, 58, 59, 60, 61, 62	66, 67, 68, 69, 70, 71, 72, 73, 74, 75
5.3	29, 31	47, 50, 55, 56	76, 77, 78, 79