# FOR TEACHERS ONLY

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

# PS–P

## PHYSICAL SETTING/PHYSICS

**Thursday,** January 29, 2009 — 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 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 . . . . **4** . . . . | 13 . . . . **3** . . . . | 25 . . . . **3** . . . . |
| 2 . . . . **2** . . . . | 14 . . . . **4** . . . . | 26 . . . . **2** . . . . |
| 3 . . . . **3** . . . . | 15 . . . . **1** . . . . | 27 . . . . **3** . . . . |
| 4 . . . . **1** . . . . | 16 . . . . **2** . . . . | 28 . . . . **1** . . . . |
| 5 . . . . **3** . . . . | 17 . . . . **2** . . . . | 29 . . . . **4** . . . . |
| 6 . . . . **3** . . . . | 18 . . . . **2** . . . . | 30 . . . . **4** . . . . |
| 7 . . . . **4** . . . . | 19 . . . . **1** . . . . | 31 . . . . **1** . . . . |
| 8 . . . . **3** . . . . | 20 . . . . **1** . . . . | 32 . . . . **1** . . . . |
| 9 . . . . **2** . . . . | 21 . . . . **3** . . . . | 33 . . . . **3** . . . . |
| 10 . . . . **4** . . . . | 22 . . . . **1** . . . . | 34 . . . . **2** . . . . |
| 11 . . . . **1** . . . . | 23 . . . . **4** . . . . | 35 . . . . **3** . . . . |
| 12 . . . . **1** . . . . | 24 . . . . **2** . . . . | |

**Part B–1**

| | |
|---|---|
| 36 . . . . **2** . . . . | 42 . . . . **1** . . . . |
| 37 . . . . **3** . . . . | 43 . . . . **4** . . . . |
| 38 . . . . **1** . . . . | 44 . . . . **4** . . . . |
| 39 . . . . **1** . . . . | 45 . . . . **3** . . . . |
| 40 . . . . **2** . . . . | 46 . . . . **1** . . . . |
| 41 . . . . **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.

On the detachable answer sheet 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.

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 29, 2009. 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

**47** [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a magnitude of 120. m.
- Allow 1 credit for a direction of east.

**48** [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a magnitude of $8.0 \times 10^3$ m/s$^2$.
- Allow 1 credit for a direction of east.

**49** [2] Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 2-credit responses:**

$$a = \frac{F_{net}}{m}$$
$$F_{net} = ma$$
$$F_{net} = (0.14 \text{ kg})(8.0 \times 10^3 \text{ m/s}^2)$$
$$F_{net} = 1.1 \times 10^3 \text{ N}$$

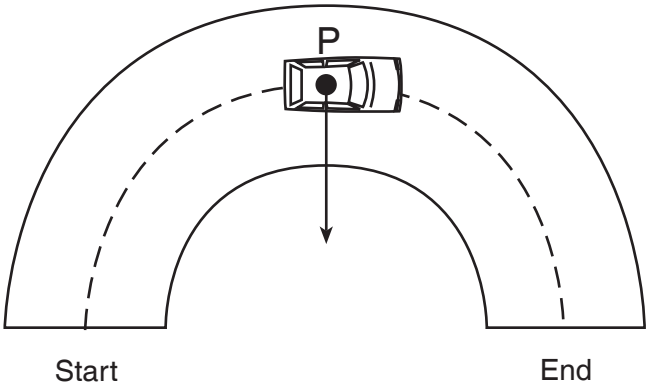
*or*

$$J = F_{net}\,t = \Delta p$$
$$F_{net} = \frac{m\Delta v}{t}$$
$$F_{net} = \frac{(0.14 \text{ kg})(80 \text{ m/s})}{1.0 \times 10^{-2} \text{ s}}$$
$$F_{net} = 1.1 \times 10^3 \text{ N}$$

**Note:** Allow credit for an answer that is consistent with the student's response to question 48.

**50** [1] Allow 1 credit for an arrow at *P* directed toward the center of curvature.

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




**51** [2] Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Example of a 2-credit response:**

$J = \Delta p = m\Delta v$
$J = (0.75 \text{ kg})(1.50 \text{ m/s})$
$J = 1.1 \text{ N} \bullet \text{s}$

**52** [1] Allow 1 credit for indicating that the magnitude of the force on each electron is the same.

**53** [2] Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Example of a 2-credit response:**

$$R = \left(\frac{\rho L}{A}\right)_{copper} = \left(\frac{\rho L}{A}\right)_{silver}$$

$$R = \frac{\rho_{copper}\ L_{copper}}{A} = \frac{\rho_{silver}\ L_{silver}}{A}$$

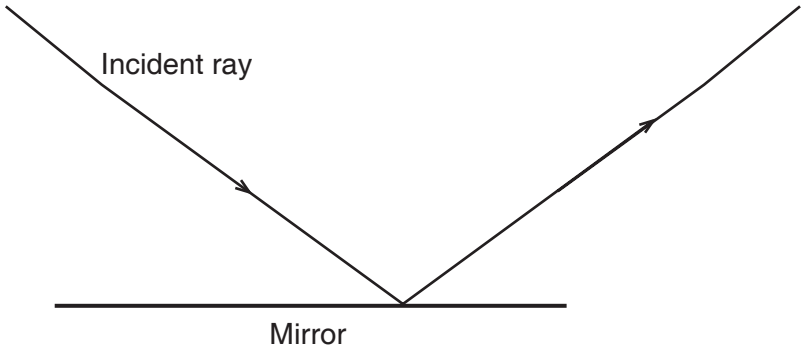
$$L_{copper} = \frac{\rho_{silver}\ L_{silver}}{\rho_{copper}}$$

$$L_{copper} = \frac{\left((1.59 \times 10^{-8}\ \Omega \bullet \text{m})(1.00 \text{ m})\right)}{1.72 \times 10^{-8}\ \Omega \bullet \text{m}}$$

$$L_{copper} = 0.924 \text{ m}$$

**54** [1] Allow 1 credit for a reflected ray at 36° ± 2° to the mirror.

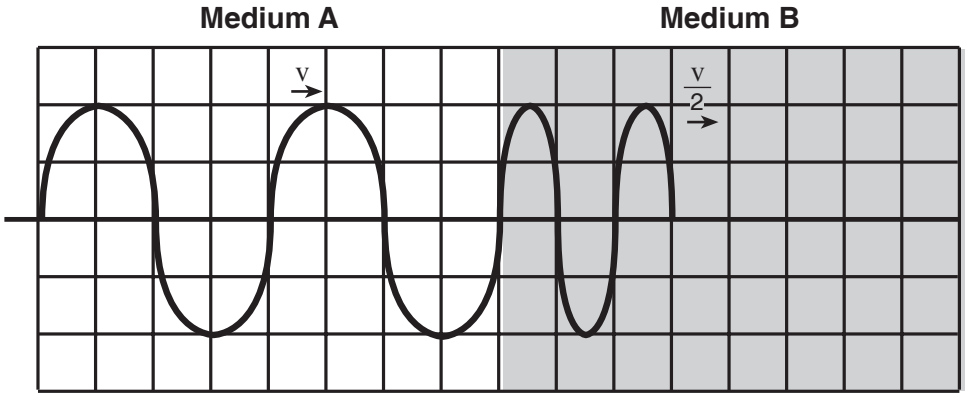
**Example of a 1-credit response:**




**Note:** Allow credit even if the reflected ray does *not* have an arrowhead. No normal needs to be drawn.

**55** [1] Allow 1 credit for *at least one* full wave with a wavelength one-half as great. If the wavelength is *not* constant, do *not* allow credit.

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




**Note:** Allow this credit even if the amplitude is *not* the same as the original wave.

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

**Example of a 2-credit response:**

$$\frac{n_2}{n_1} = \frac{\lambda_1}{\lambda_2}$$
$$\lambda_2 = \frac{n_1\,\lambda_1}{n_2}$$
$$\lambda_2 = \frac{(1.00)(5.89 \times 10^{-7}\ \text{m})}{2.42}$$
$$\lambda_2 = 2.43 \times 10^{-7}\ \text{m}$$

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

**Example of a 2-credit response:**

$$E_{photon} = \frac{hc}{\lambda}$$
$$\lambda = \frac{hc}{E_{photon}}$$
$$\lambda = \frac{(6.63 \times 10^{-34}\ \text{J•s})(3.00 \times 10^{8}\ \text{m/s})}{3.26 \times 10^{-19}\ \text{J}}$$
$$\lambda = 6.10 \times 10^{-7}\ \text{m}$$

**58** [1] Allow 1 credit for 736 J.

## Part C

**59** [2] Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Examples of 2-credit responses:**

$p_{before} = p_{after}$

$(m_1 v_1 + m_2 v_2)_{before} = (m_1 + m_2) v_{after}$

$v_{after} = \dfrac{(m_1 v_1 + m_2 v_2)_{before}}{(m_1 + m_2)}$

$v_{after} = \dfrac{(1200\ \text{kg})(12\ \text{m/s}) + (2300\ \text{kg})(0\ \text{m/s})}{1200\ \text{kg} + 2300\ \text{kg}}$

$v_{after} = 4.1\ \text{m/s}$

*or*

$p_{before} = p_{after}$

$(1200\ \text{kg})(12\ \text{m/s}) = (3500\ \text{kg}) v$

$v = 4.1\ \text{m/s}$

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

**Example of a 2-credit response:**

$F_f = \mu F_N \quad F_N = mg$

$F_f = \mu mg$

$F_f = (0.67)(1200\ \text{kg} + 2300\ \text{kg})(9.81\ \text{m/s}^2)$

$F_f = 2.3 \times 10^4\ \text{N}$

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

**Example of a 2-credit response**:

$F = \dfrac{k q_1 q_2}{r^2}$

$F = \dfrac{(8.99 \times 10^9\ \text{N} \bullet \text{m}^2/\text{C}^2)(8.0 \times 10^{-19}\ \text{C})(4.8 \times 10^{-19}\ \text{C})}{(1.2 \times 10^{-4}\ \text{m})^2}$

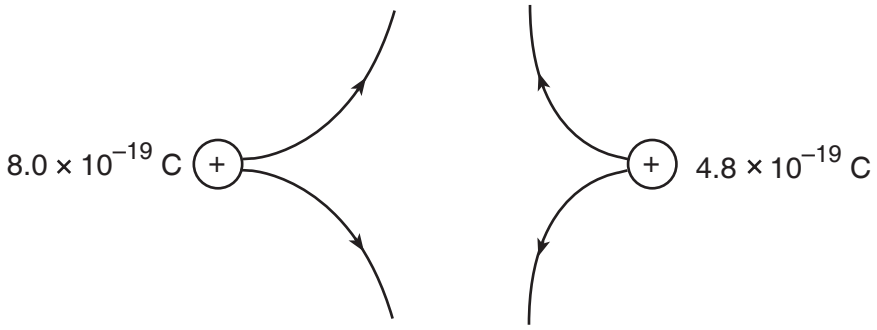
$F = 2.4 \times 10^{-19}\ \text{N}$

**62** [1] Allow 1 credit for a graph showing an inverse square relationship.

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


**63** [1] Allow 1 credit.

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




**Note:** Allow credit even if the lines are drawn symmetrically.

**64** [2] Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this rating guide.

**Example of a 2-credit response:**

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

$$\overline{v} = \frac{2(324\,\text{m})}{0.425\,\text{s}}$$

$$\overline{v} = 1520\ \text{m/s}$$

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

**Example of a 2-credit response:**

$v = f\lambda$

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

$\lambda = \dfrac{1520 \text{ m/s}}{1.18 \times 10^3 \text{ Hz}}$

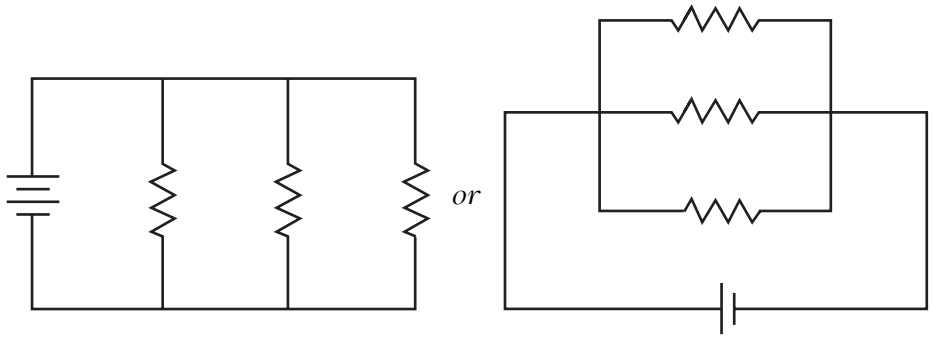
$\lambda = 1.29 \text{ m}$

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

**66** [1] Allow 1 credit for $8.47 \times 10^{-4}$ s.

**67** [1] Allow 1 credit.

**Examples of 1-credit responses:**




**Note:** Allow credit even if the student uses the symbol for a cell in place of the symbol for a battery.

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

**Examples of 2-credit responses:**

$W = I^2Rt$
$W = (2.4\,\text{A})^2\,(5.0\ \Omega)(120\,\text{s})$
$W = 3.5 \times 10^3 \text{ J}$

*or*

$W = VIt$
$W = (12\,\text{V})(2.4\,\text{A})(120\,\text{s})$
$W = 3500 \text{ J}$

**69** [1] Allow 1 credit for indicating that the energy expended in the 5.0-ohm resistor remains the same.

**Note:** Allow credit for an answer that is consistent with the student's circuit diagram in question 67.

**70** [1] Allow 1 credit for meson *or* hadron.

**71** [1] Allow 1 credit for +1e *or* 1e.

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

— The particles have enough (kinetic) energy to be converted to that much mass.
— Energy is converted to mass.

**Regents Examination in Physical Setting/Physics**

**January 2009**

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

**The *Chart for Determining the Final Examination Score for the January 2009 Regents Examination in Physical Setting/Physics* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Thursday, January 29, 2009. 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 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

| January 2009 Physical Setting/Physics | | | |
|---|---|---|---|
| **Question Numbers** | | | |
| Key Ideas | Part A | Part B | Part C |
| **Standard 1** | | | |
| Math Key Idea 1 | 2,3,5,9,12,13,15 | 41,43,44,45,46,48,49, 51,53,56,57 | 59,60,61,64,65, 66,68 |
| Math Key Idea 2 | | 38,39 | |
| Math Key Idea 3 | | | |
| Sci. Inq. Key Idea 1 | | 55 | |
| Sci. Inq. Key Idea 2 | | | |
| Sci. Inq. Key Idea 3 | | 52 | 62 |
| Eng. Des. Key Idea 1 | | | |
| **Standard 2** | | | |
| Key Idea 1 | | | 70 |
| Key Idea 2 | | | |
| **Standard 6** | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | 50 | 63 |
| Key Idea 3 | | 36 | 71,72 |
| Key Idea 4 | | | |
| Key Idea 5 | | | |
| Key Idea 6 | | | |
| **Standard 7** | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | | |
| **Standard 4 Process Skills** | | | |
| 4.1 | | 40,41,42,44,53,58 | 67,68,69 |
| 4.3 | | 54 | |
| 5.1 | 8 | 37,47 | |
| 5.3 | | | |
| **Standard 4** | | | |
| 4.1 | 9,10,11,12,13,14,15,17,18,20,21 | 39,40,41,42,43,44,45, 53,58 | 67,68,69 |
| 4.3 | 22,23,24,25,26,27,28,29,30,31,32 | 46,54,55,56 | 65,66 |
| 5.1 | 1,2,3,4,5,6,7,8,16,19 | 36,37,38,47,48,49,50, 51,52 | 59,60,61,62,63, 64 |
| 5.3 | 33,34,35 | 57 | 70,71,72 |