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 NYS Education Department web site at http://www.emsc.nysed.gov/osa/scire/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 **1.0** m or **1** m.

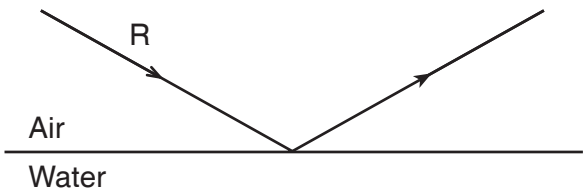
50 Allow 1 credit for **0.50** s or **0.5** s.

51 Allow 1 credit for **6.0** m/s or **6** m/s.

52 Allow 1 credit for indicating that the angle of incidence is **61**° (±2°).

53 Allow 1 credit for drawing the reflected ray with $\theta_r = 61°$ (±2°). Allow credit for a response that is consistent with the student's answer to question 52.

Example of an Acceptable Response



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

Example of an Acceptable Response

$$a = \frac{F_{net}}{m}$$
$$a = \frac{5.0\,\text{N}}{0.50\,\text{kg}}$$
$$a = 10.\ \text{m/s}^2 \ \text{ or } \ 10.\ \text{N/kg}$$

55 Allow 1 credit for **5.0** N *or* **–5.0** N.

Note: If the student indicates that the ball is kicked vertically, an answer of 10.0 N is acceptable. If the student indicates that the ball is kicked at an angle, an answer between 5.0 N and 10.0 N is acceptable.

56 Allow a maximum of 2 credits, 1 credit for **magnitude** or **size** and 1 credit for **direction**.

57 Allow 1 credit for stating that the magnitudes of the two forces are equal. Acceptable responses include, but are not limited to:

— The force of the engines is equal in magnitude to the frictional drag force.
— They are equal.
— $F_f = F_{\text{engine}}$

58 Allow 1 credit for **2**.

59 Allow a maximum of 2 credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Example of an Acceptable Response

$$V = \frac{W}{q}$$
$$V = \frac{8.35 \times 10^{-14}\,\text{J}}{1.60 \times 10^{-19}\,\text{C}}$$
$$V = 5.22 \times 10^{5}\ \text{J/C} \ \text{ or } \ 5.22 \times 10^{5}\,\text{V}$$

60 Allow 1 credit for **25.0** (±1.7) Ω.

61 Allow 1 credit for indicating that the neutron is more massive.

62 Allow 1 credit for indicating that the charge on the electron antineutrino is zero *or* neutral.

Part C

63 Allow 1 credit for indicating that the sphere is attracted to both rods.

64 Allow 1 credit for indicating that the sphere is repelled by the positive rod (only).

65 Allow 1 credit for **7.15** m/s^2.

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

Examples of Acceptable Responses

$$Ft = \Delta p$$

$$F = \frac{m\Delta v}{t}$$

$$F = \frac{(1{,}250\,\text{kg})(26.8\,\text{m/s})}{3.75\,\text{s}}$$

$$F = 8{,}930\,\text{N}$$

or

$$F = ma$$

$$F = (1{,}250\,\text{kg})(7.15\,\text{m/s}^2)$$

$$F = 8{,}940\,\text{N}$$

Allow credit for an answer that is consistent with the student's response to question 65.

67 Allow 1 credit for **12,300** N.

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

Example of an Acceptable Response

$$F_f = \mu F_N$$

$$F_f = (.80)(12{,}300\ \text{N})$$

$$F_f = 9{,}800\ \text{N} \quad or \quad 9.8 \times 10^3\ \text{N}$$

Allow credit for an answer that is consistent with the student's response to question 67.

69 Allow 1 credit for using computed values to explain whether or not the manufacturer's claim is possible. Acceptable responses include, but are not limited to:

— Yes. It is reasonable, because the available friction force is greater than the needed acceleration force.
— Yes. The friction force is greater.
— Yes. The accelerating force is less.

Allow credit for an answer that is consistent with the student's responses to questions 66 and 68.

Note: Do not allow this credit for a "yes" or "no" response without an appropriate explanation.

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

Example of an Acceptable Response

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

$$E = \frac{(6.63 \times 10^{-34}\ \text{J}\cdot\text{s})(3.00 \times 10^{8}\ \text{m/s})}{6.58 \times 10^{-7}\ \text{m}}$$

$$E = 3.02 \times 10^{-19}\ \text{J}$$

71 Allow 1 credit for **1.89** eV.

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

72 Allow 1 credit for indicating that the n_3 to n_2 transition is also **1.89** eV.

Allow credit for an answer that is consistent with the student's response to question 71.

Note: Do not allow credit for a "yes" or "no" response without an appropriate explanation.

73 Allow a maximum of 4 credits for describing an experiment that could be used to measure the acceleration due to gravity on the Moon. The response must include:

- the equipment needed [1]
- what quantities would be measured using the equipment [1]
- what procedure the students should follow [1]
- what equations and/or calculations the students would need to do to arrive at a value for the acceleration due to gravity on the Moon [1]

Acceptable responses include, but are not limited to:

freefall
— object, meterstick, stopwatch
— time of fall, distance of fall
— drop object from measured height, time its fall
— $d = v_i t + \frac{1}{2} a t^2$

pendulum
— string, mass, stopwatch, meterstick
— length of pendulum, period
— measure length of pendulum, period of pendulum
— $T = 2\pi \sqrt{\frac{\ell}{g}}$

spring scale
— spring scale, known mass
— weight on Moon of known mass
— hang the weight on the spring scale and weigh it
— $F_{g_M} = mg_M$ *or* $\frac{F_{g_M}}{F_{g_E}} = \frac{g_M}{g_E}$

74 Allow a maximum of 2 credits, 1 credit for correct frequency and 1 credit for sufficient energy (amplitude or loudness or duration).

75 Allow 1 credit for indicating that the frequency of the sound is changed by variations in the speed of the tape.