FOR TEACHERS ONLY

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICS

Friday, June 18, 1999 — 1:15 to 4:15 p.m., only

SCORING KEY

Part I

Refer to the table on the answer paper for the number of credits to be given on Part I.

Part I (65 credits)

#	1	2	3	4		#	1	2	3	4		#	1	2	3	4
1	1	**X**	3	4		**21**	**X**	2	3	4		**41**	1	2	**X**	4
2	1	2	3	**X**		**22**	1	2	**X**	4		**42**	1	**X**	3	4
3	1	2	**X**	4		**23**	**X**	2	3	4		**43**	**X**	2	3	4
4	**X**	2	3	4		**24**	1	2	**X**	4		**44**	1	**X**	3	4
5	**X**	2	3	4		**25**	1	2	3	**X**		**45**	1	2	**X**	4
6	1	**X**	3	4		**26**	1	**X**	3	4		**46**	**X**	2	3	4
7	**X**	2	3	4		**27**	**X**	2	3	4		**47**	1	**X**	3	4
8	1	**X**	3	4		**28**	1	2	3	**X**		**48**	1	2	3	**X**
9	1	2	**X**	4		**29**	1	**X**	3	4		**49**	1	2	**X**	4
10	1	2	3	**X**		**30**	1	2	3	**X**		**50**	**X**	2	3	4
11	1	2	3	**X**		**31**	1	2	3	**X**		**51**	**X**	2	3	4
12	**X**	2	3	4		**32**	1	**X**	3	4		**52**	1	**X**	3	4
13	1	**X**	3	4		**33**	1	2	3	**X**		**53**	1	2	3	**X**
14	1	**X**	3	4		**34**	1	2	3	**X**		**54**	**X**	2	3	4
15	1	2	**X**	4		**35**	1	2	**X**	4		**55**	1	2	**X**	
16	**X**	2	3	4		**36**	**X**	2	3	4						
17	1	2	3	**X**		**37**	1	**X**	3	4						
18	1	2	**X**	4		**38**	1	2	**X**	4						
19	1	2	3	**X**		**39**	1	2	3	**X**						
20	1	2	**X**	4		**40**	1	2	**X**	4						

[OVER]

Part II

Allow a total of 20 credits, one credit for each question, for only two of the six groups in this part. If more than two groups are answered, only the first two should be considered.

Group 1
Motion in a Plane

56 X 2 3 4
57 1 2 3 X
58 1 2 X 4
59 X 2 3 4
60 1 X 3 4
61 X 2 3 4
62 1 2 3 X
63 X 2 3 4
64 1 2 X 4
65 1 X 3 4

Group 3
Electromagnetic Applications

76 X 2 3 4
77 1 X 3 4
78 1 2 X 4
79 X 2 3 4
80 1 2 3 X
81 1 X 3 4
82 1 2 X 4
83 1 2 3 X
84 1 X 3 4
85 1 2 X

Group 5
Solid State

96   1 2 X 4
97   X 2 3 4
98   X 2 3 4
99   1 2 3 X
100 X 2 3 4
101 1 X 3 4
102 1 2 3 X
103 1 2 X 4
104 1 X 3
105 1 X 3

Group 2
Internal Energy

66 X 2 3 4
67 1 X 3 4
68 X 2 3 4
69 1 2 3 X
70 1 2 X 4
71 1 X 3 4
72 1 2 X 4
73 1 2 3 X
74 1 2 3 X
75 1 X 3

Group 4
Geometric Optics

86 X 2 3 4
87 1 2 3 X
88 1 X 3 4
89 1 2 3 X
90 X 2 3
91 X 2 3 4
92 1 2 X 4
93 1 X 3
94 1 2 X 4
95 1 2 3 X

Group 6
Nuclear Energy

106 1 X 3 4
107 1 2 X 4
108 1 2 X 4
109 1 2 3 X
110 X 2 3 4
111 X 2 3 4
112 1 2 3 X
113 1 X 3 4
114 X 2 3 4
115 1 X 3 4

Part III (15 credits)

Please refer to the Department publication *Regents Examination in Physics: Rating Guide for Part III*. 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 a total of two credits for questions 117, 118, 119, 122, and 125.

- Allow one 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 one 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.

116 Allow one credit.

$40.°$ *or* $40°$ $\pm2°$

117 Allow a total of two credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Examples of Acceptable Responses

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

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

$$n_2 = \frac{1.33 \sin 60.°}{\sin 40.°}$$

$$n_2 = 1.79$$

or

$$n_2 = 1.8$$

Allow credit for an answer that is consistent with the student's answer to question 116.

118 Allow a total of two credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Examples of Acceptable Responses

$$R = \frac{V}{I}$$

$$V = IR$$

$$V = (0.50 \text{ A})(5.0 \ \Omega)$$

$$V = 2.5 \text{ V}$$

or

$$V = 2.5 \text{ A} \cdot \Omega$$

119 Allow a total of two credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Examples of Acceptable Responses

$$W = VIt$$

$$W = (15 \text{ V})(0.50 \text{ A})(600. \text{ s})$$

$$W = 4.5 \times 10^3 \text{ J}$$

or

$$W = 4500 \text{ V} \cdot \text{A} \cdot \text{s}$$

120 Allow one credit.

Acceptable Response

$n = 4$ to $n = 2$

Unacceptable Response

$n = 2$ to $n = 4$

121 Allow one credit.

Examples of Acceptable Responses

4.1×10^{-19} J

or

4.08×10^{-19} J

122 Allow a total of two credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Examples of Acceptable Responses

$$E = hf$$

$$f = \frac{E}{h}$$

$$f = \frac{4.1 \times 10^{-19}\text{ J}}{6.6 \times 10^{-34}\text{ J} \cdot \text{s}}$$
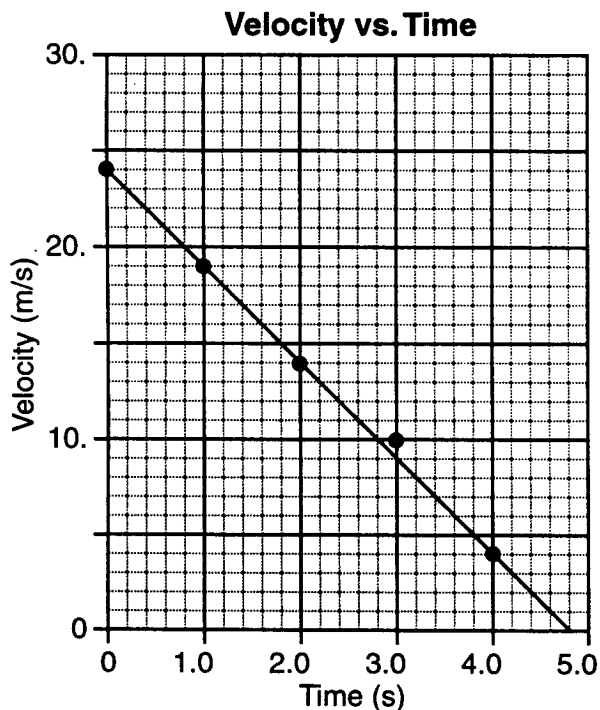
$$f = 6.2 \times 10^{14}\text{ Hz}$$

or

$$E = hf$$

$$4.08 \times 10^{-19}\text{ J} = (6.6 \times 10^{-34}\text{ J} \cdot \text{s})f$$

$$f = 6.18 \times 10^{14}\text{ 1/s}$$

Allow credit for an answer that is consistent with the student's answer to question 121.

123–124 Example of Acceptable Response

Velocity vs. Time

123 Allow one credit.

All points must be plotted accurately (±0.3 grid space).

124 Allow one credit.

The best-fit line must be straight. If one or more points are plotted incorrectly in question 123, but a best-fit line is drawn, allow this credit.

125 Allow a total of two credits. Refer to *Scoring Criteria for Calculations* in this scoring key.

Allow credit for an answer that is consistent with the student's graph, *unless* the student receives no credit for questions 123 and 124. In that case, credit may be awarded if the student correctly calculates the acceleration using data in the table.

Note: The acceleration *may* be determined by direct substitution into the equation $\bar{a} = \frac{\Delta v}{\Delta t}$, *only if* the best-fit line passes through the data values used for substitution.

Examples of Acceptable Responses

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

$$\text{slope} = \frac{-20\text{ m/s}}{4\text{ s}}$$

$$\text{slope} = -5\text{ m/s}^2 \ (\pm 0.3\text{ m/s}^2)$$

or

$$5\text{ m/s}^2 \ (\pm 0.3\text{ m/s}^2)\text{ south}$$

or

$$\bar{a} = \frac{\Delta v}{\Delta t}$$

$$\bar{a} = \frac{1\text{ m/s} - 21\text{m/s}}{4.6\text{ s} - 0.6\text{ s}}$$

$$\bar{a} = -5.0\text{ m/s}^2 \ (\pm 0.3\text{ m/s}^2)$$

or

$$5.0\text{ m/s}^2 \ (\pm 0.3\text{ m/s}^2)\text{ south}$$

Examples of Unacceptable Responses

-5 m/s^2 south *or* 5.0 m/s^2