FOR TEACHERS ONLY

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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICS

Wednesday, June 17, 1998—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	1	X	3	4	21	1	2	X	4	41	1	X	3	4
2	1	2	X	4	22	1	2	3	X	42	1	X	3	4
3	X	2	3	4	23	1	2	X	4	43	1	2	3	X
4	X	2	3	4	24	X	2	3	4	44	1	2	X	4
5	1	2	3	X	25	1	X	3	4	45	X	2	3	4
6	1	2	3	X	26	1	X	3	4	46	1	2	3	X
7	X	2	3	4	27	1	2	3	X	47	1	2	3	X
8	1	2	X	4	28	1	X	3	4	48	X	2	3	4
9	1	X	3	4	29	1	2	X	4	49	1	2	3	X
10	X	2	3	4	30	1	2	X	4	50	1	2	X	4
11	1	2	X	4	31	1	X	3	4	51	1	2	X	4
12	X	2	3	4	32	1	2	3	X	52	X	2	3	4
13	1	2	3	X	33	X	2	3	4	53	1	X	3	
14	X	2	3	4	34	1	X	3	4	54	1	2	X	
15	1	2	X	4	35	X	2	3	4	55	X	2	3	
16	X	2	3	4	36	1	2	3	X					
17	1	X	3	4	37	1	2	3	X					
18	1	2	3	X	38	1	X	3	4					
19	X	2	3	4	39	1	2	X	4					
20	1	X	3	4	40	X	2	3	4					

Directions to the teacher:

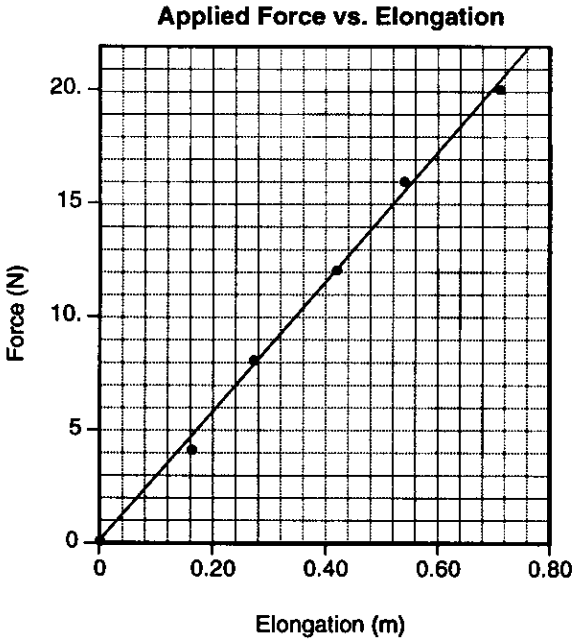
Use only *red* ink or *red* pencil in rating Regents examination papers. Do *not* correct the student's work by making insertions or changes of any kind.

Scan each answer paper to make certain that the student has marked only one answer for each question. If a student has marked two or more answers with an X in ink, draw a red line through the row of numbers for that question to indicate that no credit is to be allowed for that question when the answer paper is scored.

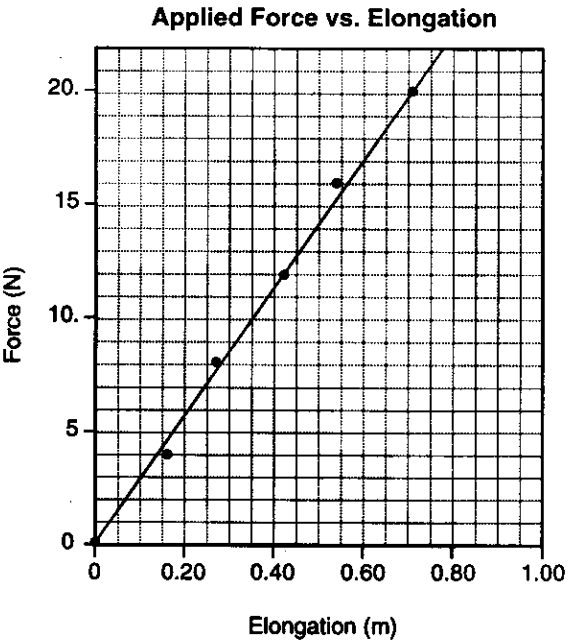
To facilitate scoring, the scoring key has been printed in the same format as the answer paper. The scoring key for **Part I and Part II** may be made into a scoring stencil by punching out the correct answers. Be sure that the stencil is aligned with the answer paper so that the holes correspond to the correct answers. To aid in proper alignment, punch out the first and last item numbers in each part and place the stencil on the answer paper so that these item numbers appear through the appropriate holes.

[OVER]

121–123 Examples of Acceptable Responses



or



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

Group 2
Internal Energy

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

Group 3
Electromagnetic Applications

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

Group 4
Geometric Optics

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

Group 5
Solid State

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

Group 6
Nuclear Energy

106	1	2	**X**	4
107	**X**	2	3	4
108	1	2	**X**	4
109	1	2	3	**X**
110	**X**	2	3	4
111	1	2	**X**	4
112	**X**	2	3	4
113	1	**X**	3	4
114	**X**	2	3	4
115	**X**	2	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, and 124.

- 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 a total of three credits.

If each of the three vectors meets *all three* of the following criteria, award a total of three credits.

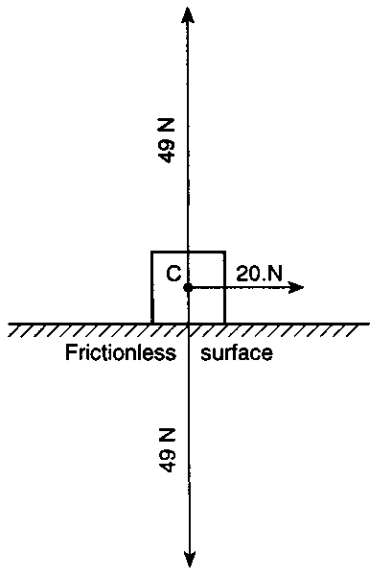
- a line originating at point *C* and having an arrowhead indicating the correct direction (A vector with either of its ends in contact with an edge of the block is acceptable.)
  - applied force: parallel to the horizontal
  - weight: perpendicular to the horizontal
  - normal force: perpendicular to the horizontal
- the vector, including its arrowhead, is drawn to the appropriate length
  - applied force: 2.0 cm ± 0.2 cm long
  - weight: 4.9 cm ± 0.2 cm long
  - normal force: 4.9 cm ± 0.2 cm long
- the vectors must be labeled
  - applied force: 20. N or 20 N
  - weight: 49 N
  - normal force: 49 N

If each of the three vectors meets *at least two* of the three criteria, award a total of two credits.

If each of the three vectors meets *at least one* of the three criteria, award a total of one credit.

[See vector diagram, top of next column.]

Example of Acceptable Response



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

Examples of Acceptable Responses

$F = ma$

$a = \frac{F}{m}$

$a = \frac{20.\ \text{N}}{5.0\ \text{kg}}$

$a = 4.0\ \text{m/s}^2$

or

$a = 4\ \text{N/kg}$

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

Examples of Acceptable Responses

$I = \frac{\Delta q}{\Delta t}$

$\Delta t = \frac{\Delta q}{I}$

$\Delta t = \frac{25\ \text{C}}{2.0 \times 10^4\ \text{A}}$

$\Delta t = 1.3 \times 10^{-3}\ \text{s}$

or

$\Delta t = 1.25 \times 10^{-3}\ \text{C/A}$

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

Examples of Acceptable Responses

$V = \frac{W}{q}$

$W = Vq$

$W = (1.8 \times 10^6\ \text{V})\ (25\ \text{C})$

$W = 4.5 \times 10^7\ \text{J}$

or

$W = 45 \times 10^6\ \text{V•C}$

120 Allow one credit. To receive this credit the response must be written in one or more complete sentences.

Examples of Acceptable Responses

Light travels much faster than sound.

The speed of light is 3.0×10^8 m/s and the speed of sound is only 3.3×10^2 m/s.

121–123 Examples of Acceptable Responses

[See the back of the Scoring Key for Part I for two acceptable graphs.]

121 Allow one credit.

The scale must be linear and the scale divisions appropriate. A scale of 0.10 meter per division is *not* acceptable.

122 Allow one credit.

All points must be plotted accurately (±0.3 grid space). Allow credit if the student correctly uses his or her response to question 121.

123 Allow one credit.

The best-fit line must be straight. If one or more points are plotted incorrectly in question 122 but a best-fit straight line is drawn, allow this credit.

124 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 credits for questions 122 and 123. In that case, credit may be awarded if the student correctly calculates the spring constant using data in the table.

Note: The slope *may* be determined by direct substitution into the equation $k = F/x$ *only* if the best-fit line passes through the *origin* and the data values used for substitution are on that line.

Example of Acceptable Response

This response is based on the assumption that the elongation of 0.42 meter due to an applied force of 12.0 newtons lies on the best-fit line and that the line passes through the *origin*.

$F = kx$

$k = \frac{F}{x}$

$k = \frac{12.0\ \text{N}}{0.42\ \text{m}}$

$k = 29\ \text{N/m}\ (\pm 2\ \text{N/m})$