

# FOR TEACHERS ONLY

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

## PHYSICAL SETTING/CHEMISTRY

Thursday, June 16, 2022 — 1:15 to 4:15 p.m., only

### 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.nysed.gov/state-assessment/high-school-regents-examinations> 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.

## Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Regents Examination in Physical Setting/Chemistry. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

At least two science teachers must participate in the scoring of the Part B–2 and Part C open-ended questions on a student’s paper. 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 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. Do not attempt to correct the student’s work by making insertions or changes of any kind. On the student’s separate answer sheet, for each question, record the number of credits earned and the teacher’s assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the box labeled “Total Raw Score.” Then the student’s raw score 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.nysed.gov/state-assessment/high-school-regents-examinations> on Thursday, June 16, 2022. The student’s scale score should be entered in the box labeled “Scale Score” on the student’s answer sheet. The scale score is the student’s final examination score.

**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.

## Part B–2

Allow a total of 15 credits for this part. The student must answer all questions in this part.

51 [1] Allow 1 credit for 3 *or* three.

52 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The energy of an electron in the first shell is less than the energy of an electron in the second shell.

The second shell electron has greater energy.

53 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$$(6.015 \text{ u})(0.0759) + (7.016 \text{ u})(0.9241)$$

$$\frac{(7.59)(6.015) + (92.41)(7.016)}{100}$$

$$(7.59\%)(6.015) + (92.41\%)(7.016)$$

**Note:** Do *not* allow credit for a numerical setup using mass numbers rather than isotopic masses.

54 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

From left to right in Period 3, the atomic radius generally decreases.

The atomic radius decreases from Na to Cl across Period 3.

Radii decrease.

55 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Aluminum atoms and sulfur atoms have a different number of outermost shell electrons per atom.

An Al atom has 3 valence electrons and an S atom has 6 valence electrons.

Aluminum tends to lose valence electrons and sulfur tends to gain valence electrons.

Aluminum tends to transfer valence electrons while sulfur tends to share valence electrons.

56 [1] Allow 1 credit for Na *or* sodium.

57 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

A  $\text{Be}^{2+}$  ion is smaller because it has only 1 shell of electrons and a Be atom has 2 shells of electrons.

The Be atom has 4 electrons and the  $\text{Be}^{2+}$  ion has 2 electrons.

A  $\text{Be}^{2+}$  ion forms when the Be atom loses 2 electrons.

A beryllium ion has two fewer electrons.

**Note:** Do *not* allow credit for a response indicating that the  $\text{Be}^{2+}$  ion lost electrons.

58 [1] Allow 1 credit. The positions of the electrons may vary.

**Examples of 1 credit responses:**



59 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The molecular formulas for the two compounds are the same, but the structural formulas are different.

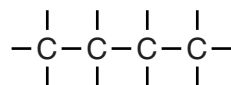
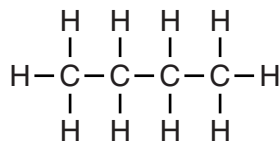
Both molecules have the same number of C atoms and the same number of H atoms, but have a different arrangement of atoms.

Both compounds are  $\text{C}_4\text{H}_8$ , but have different structures.

Both compounds are  $\text{C}_4\text{H}_8$ , but one has the double bond on an end carbon, and the other compound has the double bond between the middle carbons.

60 [1] Allow 1 credit.

**Examples of 1-credit responses.**



**Note:** Do *not* allow credit if only some of the H atoms bonded to C atoms are shown.

61 [1] Allow 1 credit for 3 *or* three.

62 [1] Allow 1 credit for  $\text{OH}^-$  *or* hydroxide *or* hydroxide ion.

**Note:** Do *not* allow credit for OH *or* hydroxyl *or* hydroxyl ion.

63 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The number of hydronium ions is the same as the number of hydroxide ions.

The number of moles of  $\text{H}_3\text{O}^+(\text{aq})$  ions equals the number of moles of  $\text{OH}^-(\text{aq})$  ions.

moles of  $\text{H}^+$  = moles of  $\text{OH}^-$

equal

same

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$\text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\ell)$

$\text{HOH} + \text{NaCl}$

65 [1] Allow 1 credit for 0.12 M *or* .12M.

### Part C

Allow a total of 20 credits for this part. The student must answer all questions in this part.

- 66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$$\frac{840 \text{ g}}{32 \text{ g/mol}}$$

$$840 \text{ g} \times \frac{1 \text{ mol}}{32 \text{ g}}$$

$$\frac{32 \text{ g}}{1 \text{ mol}} = \frac{840 \text{ g}}{x}$$

$$\frac{840}{32}$$

- 67 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

From  $-2$  to  $0$

From  $2-$  to  $0$

From negative two to zero

**Note:** Do *not* allow credit for the 2 without a minus sign ( $-$ ).

- 68 [1] Allow 1 credit for 60. mol *or* 60 mol.

- 69 [1] Allow 1 credit for 11% *or* any value from 11% to 11.223%, inclusive.

- 70 [1] Allow 1 credit for  $\underline{2}$  LiOH +  $\underline{\quad}$  CO<sub>2</sub> →  $\underline{\quad}$  Li<sub>2</sub>CO<sub>3</sub> +  $\underline{\quad}$  H<sub>2</sub>O

Allow credit even if the coefficient “1” is written in front of CO<sub>2</sub>, Li<sub>2</sub>CO<sub>3</sub> and/or H<sub>2</sub>O.

71 [1] Allow 1 credit for 5.0 ppm *or* 5 ppm.

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

The water contains  $\text{Ca}^{2+}(\text{aq})$ ,  $\text{Mg}^{2+}(\text{aq})$ , and  $\text{CO}_3^{2-}(\text{aq})$  that can move.

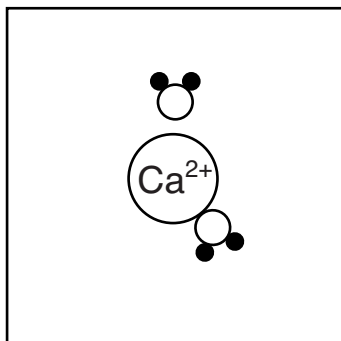
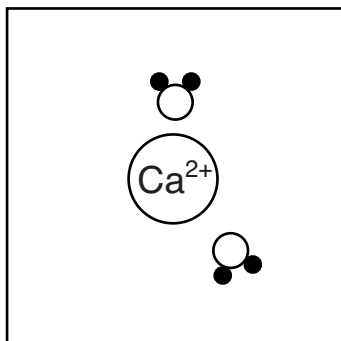
There are mobile ions in the solution.

Tap water contains aqueous ions that allow electrical conductivity.

The water contains dissolved ions.

73 [1] Allow 1 credit. Acceptable responses must show *at least two* water molecules. The oxygen atom of each water molecule must face toward the  $\text{Ca}^{2+}$  ion.

**Examples of 1-credit responses:**



74 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Heat is shown on the product side on the equation.

The energy term is on the right side of the equation.

Heat is a product.

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

One substance reacts to become two different substances.

A compound becomes a compound and an element.

76 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

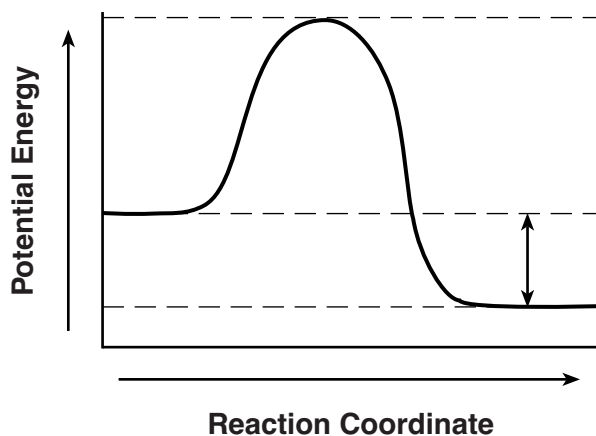
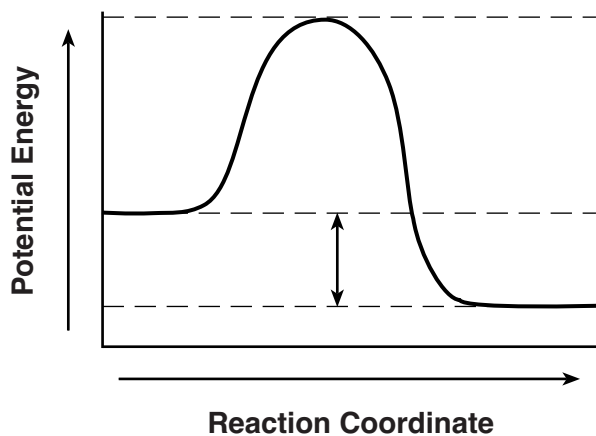
The increase in temperature of the reactant will increase the reaction rate.

The reaction will happen faster after the temperature increases.

higher temperature, faster rate

77 [1] Allow 1 credit.

**Examples of 1-credit responses:**



**Note:** The double-headed arrow ( $\updownarrow$ ) does *not* need to touch lines, but must be close.



78 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

electrons

electron

$e^-$

**Note:** Do *not* allow credit for the e without the minus sign (-).

79 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The number of electrons lost by Mg(s) equals the number of electrons gained by  $\text{Cu}^{2+}(\text{aq})$ .

The number of electrons lost and gained is the same.

equal

same

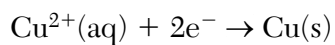
80 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

chemical potential energy

chemical

potential

81 [1] Allow 1 credit. Acceptable responses include, but are not limited to:



**Note:** Do *not* allow credit for the e without the minus sign (-).

82 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Na

calcium

Sr

barium

Cs

K

Rb

Li

83 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$\frac{1}{8}$

0.125

12.5%

84 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Protons: Both atoms contain 117 protons.

Neutrons:  $^{294}\text{Uus}$  has 177 neutrons and  $^{293}\text{Uus}$  has 176 neutrons.

Protons: same number

Neutrons: different number

85 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$^{290}_{115}\text{Uup}$

$^{290}_{115}\text{Mc}$

Uup-290

Mc-290

ununpentium-290

moscovium-290

$^{290}\text{Uup}$

$^{290}\text{Mc}$

## Regents Examination in Physical Setting/Chemistry

June 2022

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

**The *Chart for Determining the Final Examination Score for the June 2022 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: <http://www.nysed.gov/state-assessment/high-school-regents-examinations> on Thursday, June 16, 2022. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Chemistry 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.nysed.gov/state-assessment/teacher-feedback-state-assessments>.
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 2022 Physical Setting/Chemistry</b>			
<b>Question Numbers</b>			
Key Ideas/Performance Indicators	Part A	Part B	Part C
<b>Standard 1</b>			
Math Key Idea 1		36, 53, 61	66, 82
Math Key Idea 2		41	70, 81
Math Key Idea 3		32, 37, 38, 40, 65	67, 68, 69, 71, 83, 85
Science Inquiry Key Idea 1		43, 51, 52, 54, 55, 56, 57, 59, 62, 63	72, 75, 76, 78, 79, 80, 82, 84
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		32, 34, 39, 42, 44, 45, 55, 57, 64	67, 70, 74, 77, 78, 79, 80, 81, 82, 84, 85
Engineering Design Key Idea 1			
<b>Standard 2</b>			
Key Idea 1			
Key Idea 2			
Key Idea 3			
<b>Standard 6</b>			
Key Idea 1			73
Key Idea 2			
Key Idea 3		49	
Key Idea 4			
Key Idea 5			
<b>Standard 7</b>			
Key Idea 1			
Key Idea 2			
<b>Standard 4 Process Skills</b>			
Key Idea 3		31, 33, 35, 39, 41, 42, 46, 47, 48, 51, 53, 54, 56, 58, 60, 64, 65	66, 68, 70, 71, 78, 81, 82, 84
Key Idea 4		38, 40, 50	74, 77, 83, 85
Key idea 5			72
<b>Standard 4</b>			
Key Idea 3	1, 2, 3, 4, 5, 6, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28	31, 32, 33, 34, 39, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65	66, 67, 68, 69, 70, 71, 72, 75, 76, 78, 79, 80, 81, 82, 84
Key Idea 4	15, 29, 30	38, 40	74, 77, 83, 85
Key Idea 5	7, 8, 9	35, 36, 37, 50, 57	73
<b>Reference Tables</b>			
2011 Edition	4, 5, 9, 12, 13, 25, 29	31, 32, 33, 34, 36, 37, 38, 40, 41, 42, 44, 45, 46, 47, 48, 51, 52, 54, 55, 56, 57, 58, 62, 63, 65	66, 67, 69, 71, 82, 84, 85