

# FOR TEACHERS ONLY

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

## PHYSICAL SETTING/CHEMISTRY

Wednesday, August 17, 2022 — 8:30 to 11:30 a.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 Wednesday, August 17, 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 Au *or* gold.

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

The halogen atoms all have seven valence electrons.

Since atoms of these elements have the same number of outer shell electrons, they tend to have similar properties.

same number of valence electrons

All halogen atoms need one more electron to form a stable octet.

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

The chlorine atom is smaller than a chloride ion.

The Cl<sup>-</sup> ion is larger.

The atom is smaller.

**54** [1] Allow 1 credit. The positions of the electrons may vary.

**Examples of 1-credit responses:**



55 [1] Allow 1 credit for 3 *or* three.

56 [1] Allow 1 credit for 180. kPa *or* 180 kPa.

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

$$120. \text{ kPa} \times \frac{1 \text{ atm}}{101.3 \text{ kPa}}$$

$$\frac{120 \text{ kPa}}{101.3 \text{ kPa/atm}}$$

$$120 \left( \frac{1}{101} \right)$$

$$\frac{120 \text{ kPa}}{x} = \frac{100 \text{ kPa}}{1 \text{ atm}}$$

58 [1] Allow 1 credit for any value from 340. K to 360. K, inclusive.

59 [1] Allow 1 credit for 174 g *or* any value from 173.997 g to 174.3 g, inclusive.

60 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The potential energy of the water molecules increases.

The water vapor molecules have greater potential energy.

The steam has more PE.

61 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The entropy of the liquid is less than the entropy of the gas.

H<sub>2</sub>O(*ℓ*) has less entropy.

The gas is more random.

Steam is more disordered.

62 [1] Allow 1 credit for 3.4 g *or* any value from 3.4 g to 3.41 g, inclusive.

**63** [1] Allow 1 credit for 2 *or* two.

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



He-3

helium-3



**65** [1] Allow 1 credit for any nuclide on Table *N* that decays by  $\beta^-$  emission and has a half-life longer than 12.31 y. Acceptable responses include, but are not limited to:



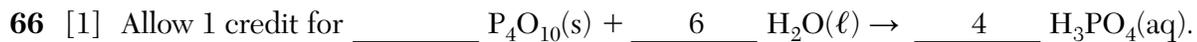
Cs-137



technetium-99

### Part C

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



Allow credit even if the coefficient “1” is written in front of  $\text{P}_4\text{O}_{10}(\text{s})$ .

67 [1] Allow 1 credit for  $\text{P}_2\text{O}_5$ . The order of the elements may vary.

68 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$$\frac{4(30.97376 \text{ u})}{283.89 \text{ u}} \times 100$$

$$\frac{4(31)(100)}{284}$$

$$\frac{123.90}{283.89} \times 100$$

$$\frac{12\,400}{283.9}$$

**Note:** Do *not* allow credit if the fraction is not multiplied by 100.

69 [1] Allow 1 credit for +5 or 5+.

**70** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

CaCO<sub>3</sub> has very low solubility.

Limestone is not soluble in water.

insoluble

**71** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

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

Heat is on the left side of the equation.

Heat must be added to decompose limestone and form lime.

**72** [1] Allow 1 credit for Ar *or* argon

**73** [1] Allow 1 credit for ionic bonding *or* ionic.

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

The number of moles of H<sup>+</sup>(aq) ions is equal to the number of moles of OH<sup>-</sup>(aq) ions.

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

The ratio of H<sup>+</sup> to OH<sup>-</sup> is 1:1.

**75** [1] Allow 1 credit for 0.21 M *or* any value from 0.2 M to 0.21 M, inclusive.

**76** [1] Allow 1 credit for C *or* carbon.

**77** [1] Allow 1 credit for propanone and propanal.

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

The Cu metal is less active than Zn metal since Cu metal does not react with any of the solutions and Zn metal reacts with two solutions.

Zinc metal is more chemically active than copper metal, because zinc reacts with  $\text{Fe}^{2+}$  ions and copper does not.

The Zn(s) reacted with the  $\text{Cu}^{2+}(\text{aq})$ , but the Cu(s) does not react with the  $\text{Zn}^{2+}(\text{aq})$ .

Zinc is dark in more solutions.

**Note:** Do *not* allow credit for a response based on Table J.

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

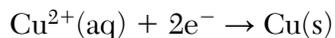
The Mg(s) strip loses the same number of electrons that the  $\text{Zn}^{2+}(\text{aq})$  ions gain.

The number of electrons lost and gained are equal.

equal

same

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



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

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

Sanding the surface of the metal strip exposes unoxidized metal for a possible reaction.

Cleaning the metal provides a fresh metal surface for the reaction.

If a reaction will occur, it is more likely with pure metal available.

removes tarnish

increase surface area of the pure metal

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

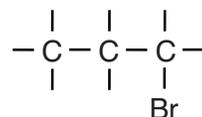
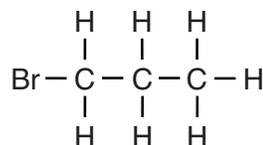
The tetrachloroethene has stronger intermolecular forces than in  $\text{CCl}_4$ .

The attractions between the molecules of tetrachloromethane are weaker.

$\text{C}_2\text{Cl}_4$  has stronger IMFs.

83 [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.

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

This nuclear reaction releases more energy per gram than a chemical reaction.

The nuclear reaction releases more energy.

A chemical reaction releases less energy.

85 [1] Allow 1 credit for 58.2 y. Significant figures do *not* need to be shown.

## Regents Examination in Physical Setting/Chemistry

August 2022

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

**The *Chart for Determining the Final Examination Score for the August 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 Wednesday, August 17, 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>August 2022 Physical Setting/Chemistry</b> |   |  |  |
|---|---|--|--|
| <b>Question Numbers</b>                       |   |  |  |
| <b>Key Ideas/Performance Indicators</b>       | <b>Part A</b>   | <b>Part B</b>  | <b>Part C</b>  |
| <b>Standard 1</b>                             |   |  |  |
| Math Key Idea 1                               |   | 34, 55, 57, 67   | 68   |
| Math Key Idea 2                               |   | 45, 58, 64   | 66, 80   |
| Math Key Idea 3                               |   | 32, 36, 37, 40, 56, 59, 62, 63, 64   | 67, 69, 70, 72, 73, 74, 75, 76, 78, 79, 81, 85         |
| Science Inquiry Key Idea 1                    |   | 31, 43, 47, 49, 51, 52, 53, 60, 61, 63, 65   | 70, 71, 72, 73, 74, 76, 78, 79, 81, 82, 84             |
| Science Inquiry Key Idea 2                    |   |  |  |
| Science Inquiry Key Idea 3                    |   | 31, 38, 39, 41, 42, 46, 47, 48, 49, 50, 51, 52, 54, 63   | 66, 67, 69, 70, 74, 77, 78, 79, 80                     |
| 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                                    |   |  |  |
| Key Idea 2                                    |   | 41, 54   | 83   |
| Key Idea 3                                    |   |  |  |
| Key Idea 4                                    |   | 43   |  |
| Key Idea 5                                    |   | 58   |  |
| <b>Standard 7</b>                             |   |  |  |
| Key Idea 1                                    |   |  |  |
| Key Idea 2                                    |   |  |  |
| <b>Standard 4 Process Skills</b>              |   |  |  |
| Key Idea 3                                    |   | 31, 33, 34, 36, 39, 40, 41, 44, 47, 48, 49, 51, 52, 56, 59, 61, 63, 64                                     | 66, 67, 73, 75, 80, 83                                 |
| Key Idea 4                                    |   | 45, 60, 62, 64   | 71, 85   |
| Key idea 5                                    |   | 54   | 72, 82   |
| <b>Standard 4</b>                             |   |  |  |
| Key Idea 3                                    | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28 | 31, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 59, 61, 63 | 66, 67, 68, 69, 70, 74, 75, 76, 77, 78, 79, 80, 81, 83 |
| Key Idea 4                                    | 18, 29, 30  | 45, 60, 62, 64, 65   | 71, 85   |
| Key Idea 5                                    | 11, 12  | 37, 53, 58   | 72, 73, 82, 84   |
| <b>Reference Tables</b>                       |   |  |  |
| 2011 Edition                                  | 1, 3, 4, 6, 7, 9, 16, 18, 28  | 33, 35, 37, 39, 46, 47, 48, 49, 51, 52, 53, 54, 56, 57, 59, 60, 62, 63, 64, 65                             | 68, 69, 70, 72, 73, 75, 76, 77, 83, 85                 |