

FOR TEACHERS ONLY

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

PHYSICAL SETTING/CHEMISTRY

Friday, January 27, 2023 — 9:15 a.m. to 12:15 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 Friday, January 27, 2023. 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. Acceptable responses include, but are not limited to:

An atom of P-32 has 15 protons and 17 neutrons. An atom of P-31 also has 15 protons but has 16 neutrons.

These two atoms have the same number of protons but a different number of neutrons.
same number of p, different number of n

52 [1] Allow 1 credit for +6 *or* 6+.

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

As atomic number increases, atomic radius increases.

Atomic radius increases.

Radius increases going down the group.

From top to bottom in Group 14, radius increases.

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

Both germanium and silicon have 4 valence electrons in the ground state.

The Si and Ge atoms have the same number of outermost shell electrons.

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

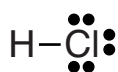
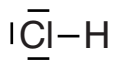
A molecule of NH_3 is polar because the distribution of charge is asymmetrical.

The molecule has an uneven charge distribution.

The center of positive charge and the center of negative charge do not coincide.

56 [1] Allow 1 credit.

Examples of 1-credit responses:



Note: Do *not* allow credit for $\bullet - \bullet$ or $\bullet - \bullet$ or $- \bullet$ for a bond because each \bullet represents one electron and each $-$ represents two electrons.

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

polar covalent bonds and ionic bonds

ionic and covalent

ionic and coordinate covalent

58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The gas atoms are closer together, so the volume of the gas is smaller. A smaller volume means a greater density because the mass remained the same.

The atoms have a smaller average distance between them.

Average distance decreases.

59 [1] Allow 1 credit for 100. mL or 100 mL.

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

The number of helium atoms at 0.50 atm is equal to the number of helium atoms at 1.50 atm.

The number of atoms is the same.

equal

same

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

The HCl(aq) has ions in water, which are mobile.

The ions in the solution move freely.

Hydrochloric acid solution contains $\text{H}^+(\text{aq})$ and $\text{Cl}^-(\text{aq})$ ions.

62 [1] Allow 1 credit for 0.110 M *or* any value from 0.11 M to 0.11012 M, inclusive.

63 [1] Allow 1 credit for 2.0 *or* 2 *or* two.

64 [1] Allow 1 credit for OH^- ion *or* hydroxide.

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

65 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

10

ten

tenfold

10 times

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:

The formula is the simplest whole number ratio of atoms of the elements in the compound.

The formula $\text{Na}_2\text{B}_4\text{O}_7$ cannot be reduced.

67 [1] Allow 1 credit for 8 mol.

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

$$0.200 \text{ mol} = \frac{x}{381 \text{ g/mol}}$$

$$(0.200 \text{ mol})(381 \text{ g/mol})$$

$$(0.2)(381)$$

$$0.200 \text{ mol} \times \frac{381 \text{ g}}{1 \text{ mol}}$$

Note: Allow credit for a setup using a gram-formula mass for borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) with any value from 381 g/mol to 382 g/mol, inclusive.

69 [1] Allow 1 credit for 3 *or* three.

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

from the air to the water

from air to H_2O

71 [1] Allow 1 credit for 31 000 J *or* any value from 30 700 J to 31 122 J, inclusive.

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

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

The 91.8 kJ of energy is a product.

The energy term is on the product side.

Note: Do *not* accept “Heat is released.” without stating supporting evidence from the equation.

73 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The rate of the forward reaction is equal to the rate of the reverse reaction.

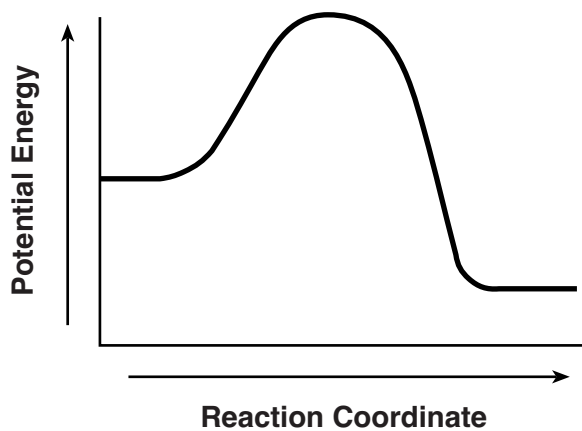
The rates are the same.

equal

same

74 [1] Allow 1 credit for showing that the PE of the products is lower than the PE of the reactants.

Example of a 1-credit response:



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

There are 4 moles of gas on the left side and 2 moles of gas on the right side of the equation, so the shift to the right relieves the increased pressure.

There are more moles of gas on the left side of the equation than on the other.

fewer moles, less pressure

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

Adding the iron will increase the rate of production of the $\text{NH}_3(\text{g})$.

The rate of the forward reaction would increase.

Forward rate increases.

The $\text{NH}_3(\text{g})$ will be produced faster.

77 [1] Allow 1 credit for C *or* carbon.

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

The formula mass of ammonium cyanate is equal to the formula mass of urea.

The formula masses of the two compounds are the same.

Ammonium cyanate and urea both have a formula mass of 60. u.

equal

same

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

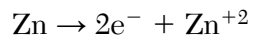
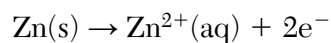
Urea and water have similar molecular polarities.

Water molecules and urea molecules are both polar.

Urea is polar.

80 [1] Allow 1 credit for any value from 1.102 V to 1.108 V, inclusive.

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:

32:26

$\frac{32}{26}$

16 to 13

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

An atom of iron is changed to an atom of cobalt.

The Fe-59 has an atomic number of 26 and becomes Co-59 with an atomic number of 27.

One element changed to a different element.

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

${}^1_0\text{n}$

n

neutron

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

$\frac{1}{8}$

0.125

12.5%

Regents Examination in Physical Setting/Chemistry
January 2023

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

The Chart for Determining the Final Examination Score for the January 2023 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 Friday, January 27, 2023. 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 <https://www.surveymonkey.com/r/8LNLLDW>.
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

January 2023 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		32,33	68,69,80
Math Key Idea 2		36,41,47,58	84
Math Key Idea 3		31,34,35,37,51,52, 59,62,65	67,71,81,82,85
Science Inquiry Key Idea 1		38,39,40,44,45,47, 48,49,50,53,54,55, 57,58,60,61,64,65	66,70,72,73,75,76, 77,78,79,82,83,84
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		34,35,36,38,39,40, 43,45,47,48,49,50, 51,52,58,64	74,81
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1			70
Key Idea 2		45, 56	
Key Idea 3		63, 65	
Key Idea 4			
Key Idea 5		42	74
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		32,33,35,36,37,38, 42,45,46,51,53,54, 59,62,64	66,67,68,73,75,76, 79,81,82
Key Idea 4		43	71, 72, 74, 84, 85
Key idea 5		40, 56	
Standard 4			
Key Idea 3	1,2,3,4,5,7,8,9,13, 14,15,17,18,19,20, 21,22,23,24,25,26, 27,29	31,32,33,34,35,36, 37,38,42,44,45,46, 47,49,50,51,52,53, 54,58,59,60,61,62, 63,64,65	66,67,68,73,75,76, 77,78,80,81,82
Key Idea 4	16, 28	43,48	69,70,71,72,74,84, 85
Key Idea 5	6, 10, 11, 12, 30	39,40,41,55,56, 57	79, 83
Reference Tables			
2011 Edition	2,4,5,7,8,9,12,13, 15,20,21,22,27,28, 29	31,33,34,37,39,40, 41,42,43,46,49,51, 53,54,56,57,59,62, 64	68,71,72,77,78,82, 83,84,85