

# FOR TEACHERS ONLY

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

## **P.S.–CH** PHYSICAL SETTING/CHEMISTRY

Wednesday, January 25, 2017 — 9:15 a.m. to 12:15 p.m., only

### SCORING KEY AND 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.p12.nysed.gov/assessment/> 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.

**Part A and Part B–1**

Allow 1 credit for each correct response.

Part A			
1 . . . . . 1 . . . . .	9 . . . . . 3 . . . . .	17 . . . . . 4 . . . . .	25 . . . . . 3 . . . . .
2 . . . . . 1 . . . . .	10 . . . . . 4 . . . . .	18 . . . . . 4 . . . . .	26 . . . . . 2 . . . . .
3 . . . . . 2 . . . . .	11 . . . . . 3 . . . . .	19 . . . . . 1 . . . . .	27 . . . . . 4 . . . . .
4 . . . . . 4 . . . . .	12 . . . . . 4 . . . . .	20 . . . . . 4 . . . . .	28 . . . . . 4 . . . . .
5 . . . . . 4 . . . . .	13 . . . . . 2 . . . . .	21 . . . . . 2 . . . . .	29 . . . . . 3 . . . . .
6 . . . . . 1 . . . . .	14 . . . . . 3 . . . . .	22 . . . . . 4 . . . . .	30 . . . . . 3 . . . . .
7 . . . . . 3 . . . . .	15 . . . . . 3 . . . . .	23 . . . . . 2 . . . . .	
8 . . . . . 3 . . . . .	16 . . . . . 1 . . . . .	24 . . . . . 3 . . . . .	
Part B–1			
31 . . . . . 1 . . . . .	36 . . . . . 3 . . . . .	41 . . . . . 3 . . . . .	46 . . . . . 4 . . . . .
32 . . . . . 3 . . . . .	37 . . . . . 4 . . . . .	42 . . . . . 1 . . . . .	47 . . . . . 3 . . . . .
33 . . . . . 1 . . . . .	38 . . . . . 4 . . . . .	43 . . . . . 2 . . . . .	48 . . . . . 1 . . . . .
34 . . . . . 1 . . . . .	39 . . . . . 1 . . . . .	44 . . . . . 4 . . . . .	49 . . . . . 2 . . . . .
35 . . . . . 4 . . . . .	40 . . . . . 2 . . . . .	45 . . . . . 3 . . . . .	50 . . . . . 1 . . . . .

## 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*.

**Do not attempt to correct the student's work by making insertions or changes of any kind. If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.**

Allow 1 credit for each correct response.

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 Scoring Key and 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. 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.p12.nysed.gov/assessment/> on Wednesday, January 25, 2017. 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:

Arsenic atoms and antimony atoms each have 5 valence electrons.

An As atom and a Sb atom both have five outermost electrons.

same number of valence e<sup>-</sup>

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

Ar

argon

element 18

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

An electron in the first shell has less energy than an electron in the third shell.

The third shell electron has higher energy.

3<sup>rd</sup> shell > 1<sup>st</sup> shell

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

The 0.30-cm<sup>3</sup> sample of graphite has fewer carbon atoms than the 0.30-cm<sup>3</sup> sample of diamond.

The diamond sample has more atoms.

more C atoms in the diamond

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

$$\frac{2.3 \text{ g/cm}^3 - 2.2 \text{ g/cm}^3}{2.2 \text{ g/cm}^3} \times 100$$

$$\frac{2.3 - 2.2}{2.2} \times 100$$

$$\frac{0.1(100)}{2.2}$$

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$$\frac{42.2 \text{ g}}{100. \text{ g/mol}}$$

$$42.2 \text{ g} \times \frac{1.00 \text{ mol}}{100. \text{ g}}$$

$$\frac{x}{42.2} = \frac{1}{100}$$

57 [1] Allow 1 credit for 48.0% *or* for any value from 47.9% to 48%, inclusive.

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

The rate of the chemical reaction increases because the reactant molecules move faster and collide with more kinetic energy.

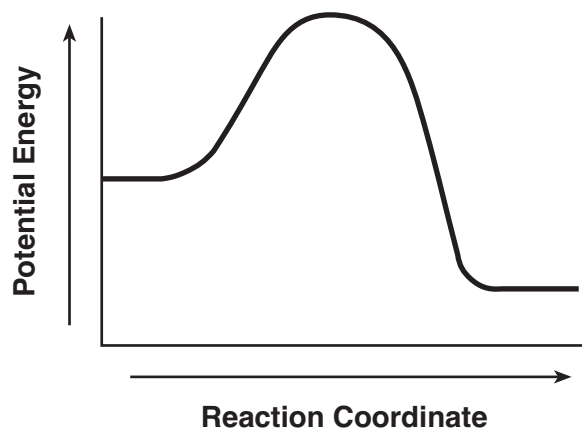
Increasing the temperature causes more frequent collisions.

As molecules acquire more kinetic energy, the probability of effective collisions increases.

More reactant molecules collide with sufficient energy.

59 [1] Allow 1 credit for showing that the potential energy of the products is lower than the potential energy of the reactants.

**Example of a 1-credit response:**



60 [1] Allow 1 credit for 2.3 L *or* for any value from 2.29 L to 2.3 L, inclusive.

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

Temperature: higher/increase

Pressure: lower/decrease

Temperature: above 298 K

Pressure: below 1.0 atm

**62** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$\text{H}^+(\text{aq})$

$\text{H}_3\text{O}^+$

hydrogen ions

hydronium

**63** [1] Allow 1 credit for 4 *or* four.

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

0.80 M

$8.0 \times 10^{-1}$  M

.8 M

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

Multiple trials may improve the precision of results.

Each trial may involve errors either above or below the acceptable value. Therefore, an average value may be more accurate.

Results can be shown to be reproducible.

Multiple trials help cancel random errors.

### 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:

from water vapor to the dry ice

from  $\text{H}_2\text{O}(\text{g})$  to  $\text{CO}_2(\text{s})$

from water to  $\text{CO}_2$

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

The potential energy of the  $\text{H}_2\text{O}(\text{g})$  molecules is higher than the potential energy of the  $\text{H}_2\text{O}(\ell)$  molecules.

The water vapor has greater PE.

There is less PE in the liquid water.

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

The block of dry ice with less mass contains less thermal energy.

There is more thermal energy in the 2.0-kg block.

**69** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The particles are distributed uniformly throughout the coolant mixture.

There is an even distribution of molecules in the solution.

The water and ethylene glycol molecules mix uniformly.

All particles are evenly dispersed.

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

Water molecules and ethylene glycol molecules are both polar.

Water and the glycol have similar polarities.

**71** [1] Allow 1 credit for any value from 21% to 23%, inclusive.

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

3200 mL

$3.2 \times 10^3$  mL

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

In ethene, there is a double bond between the two carbon atoms, which makes the compound unsaturated.

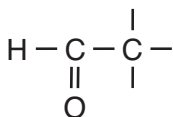
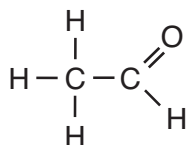
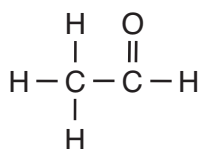
More H atoms can bond with C atoms.

has C=C

Two carbons share four electrons.

74 [1] Allow 1 credit.

**Examples of 1-credit responses:**



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

The  $\text{CH}_3\text{CH}_2\text{OH}$  has 2 carbon atoms, 6 hydrogen atoms, and 1 oxygen atom, while the  $\text{CH}_3\text{CHO}$  has 2 carbon atoms, 4 hydrogen atoms, and 1 oxygen atom.

They don't have the same number of H atoms.

different molecular formulas

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

organic acid

carboxylic acid

acids

**77** [1] Allow 1 credit for 3 mol *or* three mol.

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

pH value of the soil

soil pH

**79** [1] Allow 1 credit for blue.

**80** [1] Allow 1 credit for +5 *or* 5 *or* five.

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

The salt bridge allows ions to flow between the two half-cells.

It maintains the electrical neutrality of the solutions.

prevents polarization of the half-cells

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

Magnesium atoms lose electrons and become magnesium ions in the solution.

Some of the Mg atoms oxidize to  $\text{Mg}^{2+}$  ions, decreasing the electrode mass.

Atoms become aqueous  $\text{Mg}^{2+}$  ions.

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

${}^0_{-1}\text{e}$

${}^0_{-1}\beta$

$\beta^-$



**84** [1] Allow 1 credit for 43 protons and 56 neutrons.

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

$$\frac{1}{16}$$

0.0625

6.25%

## Regents Examination in Physical Setting/Chemistry

January 2017

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

**The *Chart for Determining the Final Examination Score for the January 2017 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Wednesday, January 25, 2017. 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.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm>.
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 2017 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
<b>Standard 1</b>			
Math Key Idea 1		49, 55, 56, 63	71, 78
Math Key Idea 2		54, 59	68, 72
Math Key Idea 3		25, 36, 37, 40, 41, 57, 60, 64	72, 77, 80, 84, 85
Science Inquiry Key Idea 1		32, 34, 48, 50, 51, 53, 54, 58, 61, 62, 63, 65	67, 69, 70, 73, 75, 76, 78, 81, 82
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		33, 34, 38, 39, 43, 45, 46, 47, 50, 53, 59, 65	74, 75, 80, 82
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			66
Key Idea 2		55, 60	
Key Idea 3		42	
Key Idea 4			
Key Idea 5			71
<b>Standard 7</b>			
Key Idea 1			
Key Idea 2			
<b>Standard 4 Process Skills</b>			
Key Idea 3		31, 33, 35, 36, 37, 41, 43, 44, 47, 49, 52, 56, 58, 60, 64	70, 72, 74, 76, 77, 79, 81, 84
Key Idea 4		40, 59	67, 68, 83, 85
Key idea 5			
<b>Standard 4</b>			
Key Idea 3	1, 2, 3, 4, 5, 6, 7, 9, 10, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29	31, 32, 33, 34, 35, 36, 37, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, 63, 64, 65	69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80, 81, 82, 84
Key Idea 4	30	40, 41, 59	66, 67, 68, 83, 85
Key Idea 5	8, 11, 12, 13, 19	38	73
<b>Reference Tables</b>			
2011 Edition	2, 4, 5, 6, 7, 10, 11, 15, 22, 24, 29	31, 32, 33, 34, 37, 38, 39, 40, 41, 45, 47, 51, 52, 54, 55, 56, 57, 59, 60, 62, 64	73, 74, 76, 79, 80, 83, 84