

# FOR TEACHERS ONLY

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

## P.S.–CH PHYSICAL SETTING/CHEMISTRY

Tuesday, June 21, 2016 — 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 . . . . . 4 . . . . .	9 . . . . . 2 . . . . .	17 . . . . . 3 . . . . .	25 . . . . . 2 . . . . .
2 . . . . . 3 . . . . .	10 . . . . . 4 . . . . .	18 . . . . . 4 . . . . .	26 . . . . . 1 . . . . .
3 . . . . . 2 . . . . .	11 . . . . . 3 . . . . .	19 . . . . . 3 . . . . .	27 . . . . . 4 . . . . .
4 . . . . . 4 . . . . .	12 . . . . . 2 . . . . .	20 . . . . . 2 . . . . .	28 . . . . . 3 . . . . .
5 . . . . . 1 . . . . .	13 . . . . . 1 . . . . .	21 . . . . . 3 . . . . .	29 . . . . . 3 . . . . .
6 . . . . . 2 . . . . .	14 . . . . . 1 . . . . .	22 . . . . . 1 . . . . .	30 . . . . . 4 . . . . .
7 . . . . . 1 . . . . .	15 . . . . . 2 . . . . .	23 . . . . . 3 . . . . .	
8 . . . . . 2 . . . . .	16 . . . . . 4 . . . . .	24 . . . . . 3 . . . . .	
Part B–1			
31 . . . . . 1 . . . . .	36 . . . . . 3 . . . . .	41 . . . . . 2 . . . . .	46 . . . . . 2 . . . . .
32 . . . . . 3 . . . . .	37 . . . . . 2 . . . . .	42 . . . . . 1 . . . . .	47 . . . . . 2 . . . . .
33 . . . . . 4 . . . . .	38 . . . . . 3 . . . . .	43 . . . . . 4 . . . . .	48 . . . . . 2 . . . . .
34 . . . . . 3 . . . . .	39 . . . . . 2 . . . . .	44 . . . . . 2 . . . . .	49 . . . . . 4 . . . . .
35 . . . . . 1 . . . . .	40 . . . . . 3 . . . . .	45 . . . . . 4 . . . . .	50 . . . . . 2 . . . . .

## 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 Tuesday, June 21, 2016. 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. The position of electrons may vary.

**Examples of 1-credit responses:**



- 52** [1] Allow 1 credit for \_\_\_\_\_  $\text{H}_2(\text{g}) +$  \_\_\_\_\_  $\text{Cl}_2(\text{g}) \rightarrow$   2   $\text{HCl}(\text{g})$ .

Allow credit even if the coefficient “1” is written in front of  $\text{H}_2(\text{g})$  and/or  $\text{Cl}_2(\text{g})$ .

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

Iodine has stronger intermolecular forces than chlorine.

The forces between  $\text{Cl}_2$  molecules are weaker.

Dispersion forces are stronger in  $\text{I}_2$ .

The molecules of  $\text{I}_2$  attract each other more.

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

The Na oxidizes easily in the presence of air.

Sodium reacts with chlorine to form NaCl.

Sodium forms compounds.

- 55** [1] Allow 1 credit for  $98^\circ\text{C}$ .

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

When water freezes it expands, making  $\text{H}_2\text{O}(\text{s})$  less dense than  $\text{H}_2\text{O}(\ell)$ .

The distance between the  $\text{H}_2\text{O}$  molecules is greater in the solid phase.

The density of liquid water is greater.

The density of ice is less.

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

hydrogen bonding

H bonding

dipole-dipole

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

$$1.13 \times 10^5 \text{ J}$$

$$113\,000 \text{ J}$$

$$113,000 \text{ J}$$

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

$$\frac{3.00 \text{ g}}{151 \text{ g/mol}}$$

$$3 \text{ g} \times \frac{1 \text{ mol}}{151 \text{ g}}$$

$$\frac{151 \text{ g}}{1 \text{ mol}} = \frac{3 \text{ g}}{x}$$

$$\frac{3}{151}$$

**60** [1] Allow 1 credit for 2.0 mol. Significant figures do *not* need to be shown.

**61** [1] Allow 1 credit for red.

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

$$1.0 \times 10^{-5} \text{ M}$$

$$1 \times 10^{-5} \text{ M}$$

$$0.000\,01 \text{ M}$$

$$10^{-5} \text{ M}$$

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

Pressure times volume for the first three trials is constant at 0.412.

As the volume is increased, the pressure decreases proportionally.

There is no change for  $P \times V$ .

$$P_1V_1 = P_2V_2 = P_3V_3$$

$$PV = \text{constant}$$

**64** [1] Allow 1 credit for 0.300 atm. Significant figures do *not* need to be shown.

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

The average distance between helium atoms is smaller in trial 1 than in trial 3.

In trial 3, the atoms are farther apart.

The separation is greater in trial 3.

Atoms are closer in trial 1.

The smaller the volume, the closer the gas molecules.

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### 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:

polar covalent and ionic

ionic and covalent

polar and ionic

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

argon

Ar

element 18

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

The radius of a potassium ion is smaller than the radius of a potassium atom.

The radius of the atom is greater.

The  $K^+$  ions are smaller.

$K^+ < K$

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

$$\frac{172 \text{ mg} - 170. \text{ mg}}{170. \text{ mg}} \times 100$$

$$\frac{2(100)}{170}$$

**70** [1] Allow 1 credit for  $CH_2O$ . The order of the elements may vary.

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

Photosynthesis is an endothermic reaction because light energy is absorbed.

The energy term is on the left side of equation.

$\Delta H$  is positive.

The reaction requires light.

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

The configuration represents a higher energy state than sodium's ground state, 2-8-1.

Not all 11 electrons are in their lowest possible energy levels.

A second shell electron has moved to the fourth shell.

A lower shell electron is shown in a higher shell.

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

When strontium electrons in an excited state move to a lower energy state, specific amounts of energy are emitted.

Energy is emitted when electrons in higher electron shells move to lower electron shells.

Light of specific wavelengths is emitted when electrons fall to lower energy levels.

Electrons move from higher shells to lower shells.

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

Find the element that emits light with the same wavelengths as observed.

The spectral lines are compared to known bright-line spectra.

The spectra from the flame tests are matched to lines on the chart of element spectra.

Compare the spectral wavelengths to those of known elements.

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

$2(12.011 \text{ g/mol}) + 15.9994 \text{ g/mol} + 6(1.00794 \text{ g/mol})$

$2(12) + 16 + 6(1)$

$24.0 + 16.0 + 6.0$

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

Both water and methanoic acid have polar molecules.

Both molecules are polar.

Polar dissolves polar.

Reactant 2 molecules and the water molecules have similar polarities.

**77** [1] Allow 1 credit for ester *or* esters.

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

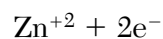
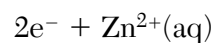
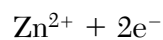
The salt bridge allows ions to migrate between the half-cells.

Electrical neutrality of the solutions is maintained.

The purpose is to prevent polarization.

allows charge to flow

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



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

Zn is more active than Cu.

Zinc oxidizes more easily than copper.

Zn is a better reducing agent.

Cu is located below Zn on Table J.



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

battery

external power source

source of electricity

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

gamma radiation

gamma

$\gamma$

X-ray radiation

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

${}_{90}^{234}\text{Th}$

${}^{234}\text{Th}$

Th-234

thorium-234

**84** [1] Allow 1 credit for 141.

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

natural transmutation

transmutation

nuclear decay

radioactive decay

decay

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## Regents Examination in Physical Setting/Chemistry

June 2016

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

**The *Chart for Determining the Final Examination Score for the June 2016 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Tuesday, June 21, 2016. 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

June 2016 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
<b>Standard 1</b>			
Math Key Idea 1		32, 55, 59	69, 75
Math Key Idea 2		36, 40, 42, 52, 63	
Math Key Idea 3		34, 35, 37, 46, 48, 55, 58, 60, 62, 64	70, 79, 83, 84
Science Inquiry Key Idea 1		39, 41, 49, 53, 56, 57, 65	66, 68, 71, 72, 73, 74, 76, 77, 78, 80, 81, 82, 85
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		34, 35, 38, 43, 45, 47, 48, 52, 61, 63	79, 83
Engineering Design Key Idea 1			
<b>Standard 2</b>			
Key Idea 1		54	
Key Idea 2			
Key Idea 3			
<b>Standard 6</b>			
Key Idea 1		56	
Key Idea 2		48, 51	
Key Idea 3		62	
Key Idea 4		44	
Key Idea 5			
<b>Standard 7</b>			
Key Idea 1			
Key Idea 2			
<b>Standard 4 Process Skills</b>			
Key Idea 3		31, 32, 33, 34, 36, 38, 40, 42, 43, 44, 45, 48, 50, 52, 59, 60, 61, 64, 65	70, 72, 74, 75, 76, 77, 79, 80, 81, 84
Key Idea 4		58	71, 83
Key idea 5		51, 53, 57	67
<b>Standard 4</b>			
Key Idea 3	1, 2, 3, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 24, 25, 26, 27, 29	31, 32, 33, 34, 35, 36, 37, 38, 40, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, 61, 62, 63, 64, 65	69, 70, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 84
Key Idea 4	19, 28	55, 58	71, 83, 85
Key Idea 5	4, 8, 9, 22, 30	39, 41, 51, 53, 57	66, 67, 68
<b>Reference Tables</b>			
2011 Edition	3, 5, 6, 7, 9, 12, 21, 22, 23, 24, 28, 29	31, 33, 34, 35, 36, 37, 42, 45, 46, 47, 49, 51, 55, 58, 59, 61, 64	66, 67, 68, 69, 72, 75, 77, 79, 80, 82, 83, 84