

FOR TEACHERS ONLY

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

P.S.–CH PHYSICAL SETTING/CHEMISTRY

Thursday, August 16, 2018 — 8:30 to 11:30 a.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 1 | 25 2 |
| 2 2 | 10 2 | 18 2 | 26 1 |
| 3 2 | 11 4 | 19 2 | 27 4 |
| 4 4 | 12 3 | 20 3 | 28 1 |
| 5 3 | 13 2 | 21 3 | 29 2 |
| 6 1 | 14 2 | 22 2 | 30 3 |
| 7 4 | 15 3 | 23 4 | |
| 8 1 | 16 4 | 24 3 | |
| Part B–1 | | | |
| 31 1 | 36 4 | 41 3 | 46 3 |
| 32 3 | 37 4 | 42 2 | 47 4 |
| 33 2 | 38 2 | 43 2 | 48 3 |
| 34 1 | 39 1 | 44 1 | 49 2 |
| 35 1 | 40 2 | 45 4 | 50 4 |

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 Thursday, August 16, 2018. 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:

$$\frac{3(16 \text{ g/mol})}{102 \text{ g/mol}} \times 100$$

$$\frac{(15.9994 \times 3)(100)}{102}$$

$$\frac{48}{102} \times 100$$

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

distillation

distilling

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

Atoms of isotopes *D*, *E* and *G* have the same number of protons.

They each have 12 protons.

54 [1] Allow 1 credit for 2 *or* two.

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

An electron in the first shell of an atom of isotope *E* has less energy than an electron in the second shell.

In an atom of *E*, an electron in the 2nd energy level has more energy than an electron in the 1st energy level.

Electrons in shell 2 have higher energies than shell 1 electrons.

lower in shell 1

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

Electronegativity generally decreases as the metals in Group 2 are considered in order of increasing atomic number.

Electronegativity decreases.

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

The atoms in Group 2 elements have the same number of valence electrons and, therefore, similar chemical properties.

Their atoms all have two valence electrons.

Group 2 elements have 2 outermost electrons in each atom.

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

An atom of Ba has three more electron shells than an atom of Mg, so less energy is required to remove one of the outermost electrons from an atom of Ba.

Barium atoms have more inner shell electrons, resulting in a greater shielding effect.

Magnesium's valence electrons are closer to the nucleus.

Barium has a larger atomic radius.

59 [1] Allow 1 credit for any value from 15 g to 18 g, inclusive.

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

The solubility at 1 atm increases as the temperature decreases.

As the temperature of the solution increases, the solubility of SO_2 decreases.

At lower temperatures, more SO_2 can dissolve.

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

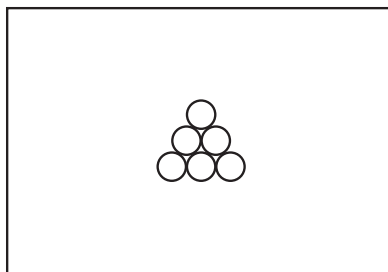
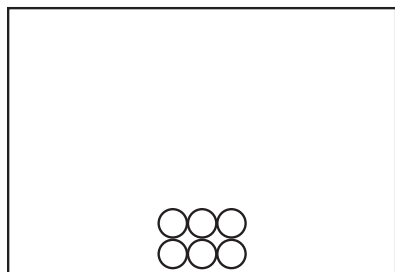
More $\text{SO}_2(\text{g})$ can be dissolved in water when the pressure increases.

At higher pressure, sulfur dioxide is more soluble.

Solubility increases.

- 62 [1] Allow 1 credit for a diagram with *at least six* molecules drawn to represent the solid phase of the sample.

Examples of 1-credit responses:



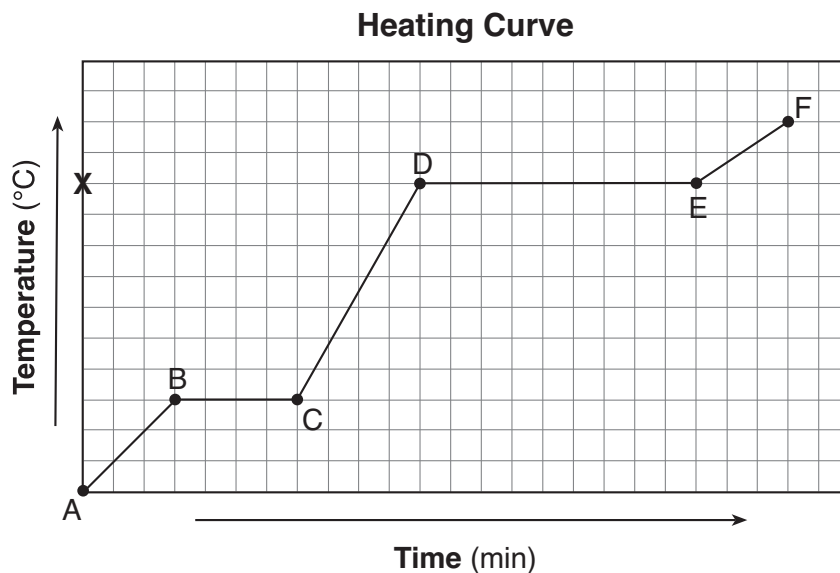
- 63 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The average kinetic energy of the molecules during interval *BC* is less than the average kinetic energy of the molecules during interval *DE*.

During interval *DE*, the average kinetic energy is higher.

- 64 [1] Allow 1 credit for an **X** marked on the axis labeled “Temperature (°C)” in line with interval *DE*.

Example of a 1-credit response



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

No new substance is formed.

The phase changes do not change the chemical properties of the substance.

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:

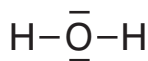
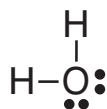
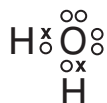
Dynamic equilibrium is reached when the rates of the forward and reverse reactions are equal.

The rates in opposing directions are equal.

The rates are the same.

67 [1] Allow 1 credit.

Examples of 1-credit responses:



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

Increasing the surface area of the hot carbon increases the frequency of effective collisions, which increases the rate of the forward reaction.

More collisions between C atoms and H₂O molecules speed up the reaction.

More effective collisions occur.

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

The solution would decrease in temperature because the dissolving of KNO₃(s) is endothermic.

The heat of solution is positive, which means the mixture would decrease in temperature.

The ΔH is + 34.89 kJ, so KNO₃(s) requires energy to dissolve.

70 [1] Allow 1 credit for 33% or any value from 33% to 33.3% inclusive.

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

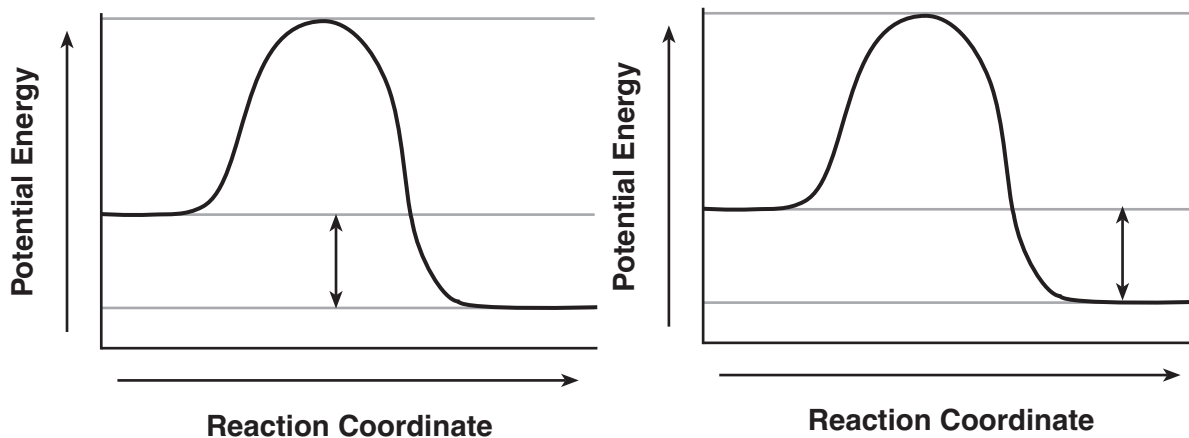
The freezing point of mixture 4 is lower than the freezing point of water.

Mixture 4 freezes below 0°C .

The FP of H_2O is higher.

72 [1] Allow 1 credit.

Examples of 1-credit responses:

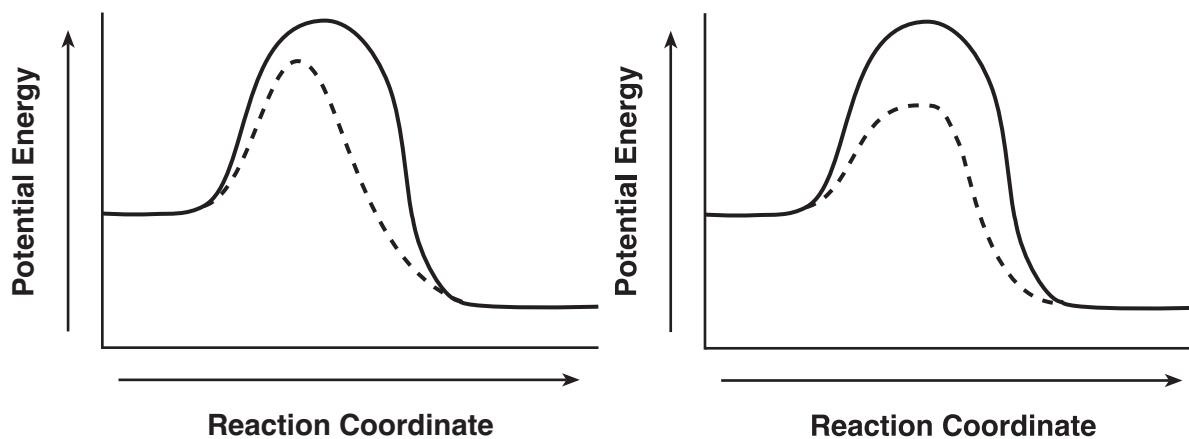


Note: Do *not* allow credit for a single-headed arrow (\uparrow).

73 [1] Allow 1 credit for 4.0 mol *or* 4 mol.

74 [1] Allow 1 credit.

Examples of 1-credit responses:



Note: Do *not* allow credit if the potential energy of the reactants or products is changed.

75 [1] Allow 1 credit for alcohol *or* alcohols.

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

77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Hydrocarbons contain only carbon and hydrogen, but compound *B* also contains oxygen.

Compound *B* contains carbon, hydrogen, and a different element.

This compound includes oxygen.

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

hydronium ion H_3O^+

hydronium H^+

hydrogen ion $\text{H}_3\text{O}^+(\text{aq})$

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

proton

79 [1] Allow 1 credit for Na_2SO_4 .

80 [1] Allow 1 credit for any value from 24 mL to 26 mL, inclusive.

81 [1] Allow 1 credit for pink.

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

The $^{235}_{92}\text{U}$ nuclide splits into two different smaller nuclides.

the splitting of a large atom into two smaller ones

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

Protons: 60

Neutrons: 90

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

$^{81}_{33}\text{As}$

As-81

arsenic-81

^{81}As

85 [1] Allow 1 credit for 30.4 s. Significant figures do *not* need to be shown.

Regents Examination in Physical Setting/Chemistry

August 2018

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

The *Chart for Determining the Final Examination Score for the August 2018 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: <http://www.p12.nysed.gov/assessment/> on Thursday, August 16, 2018. 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

| August 2018 Physical Setting/Chemistry | | | |
|---|---|---|--|
| Question Numbers | | | |
| Key Ideas/Performance Indicators | Part A | Part B | Part C |
| Standard 1 | | | |
| Math Key Idea 1 | | 51, 59, 62, 64 | |
| Math Key Idea 2 | | 34, 60, 61 | 80 |
| Math Key Idea 3 | | 31, 35, 36, 39, 40, 41, 42, 45, 46, 64 | 70, 73, 79, 83, 84, 85 |
| Science Inquiry Key Idea 1 | | 38, 43, 49, 52, 53, 54, 55, 56, 57, 58, 59, 61, 65 | 66, 68, 69, 71, 75, 76, 77, 78, 81, 82, 83 |
| Science Inquiry Key Idea 2 | | | |
| Science Inquiry Key Idea 3 | | 32, 33, 34, 35, 36, 37, 38, 44, 46, 50, 53, 57, 60, 65 | 67, 69, 70, 72, 74, 78, 79, 80, 82, 83, 84 |
| Engineering Design Key Idea 1 | | | |
| Standard 2 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | | |
| Key Idea 3 | | | |
| Standard 6 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | 43, 45 | 67, 72, 74 |
| Key Idea 3 | | 49, 62 | |
| Key Idea 4 | | | |
| Key Idea 5 | | 60, 63, 64 | |
| Standard 7 | | | |
| Key Idea 1 | | | |
| Key Idea 2 | | | |
| Standard 4 Process Skills | | | |
| Key Idea 3 | | 32, 37, 40, 42, 47, 48, 54, 56, 58, 59, 60, 62, 65 | 66, 68, 70, 73, 75, 77, 79, 80, 81, 83 |
| Key Idea 4 | | 41, 63 | 69, 72, 74, 84, 85 |
| Key idea 5 | | | 67 |
| Standard 4 | | | |
| Key Idea 3 | 1, 2, 3, 4, 5, 6, 8, 9, 16, 18, 20, 21, 23, 24, 25, 26, 27, 28 | 31, 32, 33, 34, 35, 36, 37, 40, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 65 | 66, 68, 70, 71, 73, 74, 75, 76, 77, 78, 79, 80, 81, 83 |
| Key Idea 4 | 14, 17, 30 | 41, 50, 63 | 69, 72, 82, 84, 85 |
| Key Idea 5 | 7, 10, 11, 12, 13, 15, 19, 22, 29 | 38, 39, 64 | 67 |
| Reference Tables | | | |
| 2011 Edition | 3, 5, 6, 13, 15, 21, 22, 27, 28 | 31, 32, 33, 34, 35, 38, 39, 40, 41, 42, 44, 45, 46, 47, 51, 53, 54, 56, 57, 58, 59, 60 | 67, 69, 70, 75, 76, 77, 78, 79, 81, 83, 84 |