FOR TEACHERS ONLY

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

PHYSICAL SETTING/CHEMISTRY

Friday, January 24, 2020 — 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.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.

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.p12.nysed.gov/assessment/ on Friday, January 24, 2020. 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 16 protons and 17 neutrons.

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

$(31.972\text{ u})(0.9499) + (32.971\text{ u})(0.0075) + (33.968\text{ u})(0.0425) + (35.967\text{ u})(0.0001)$

$$\frac{31.972(94.99) + 32.971(0.75) + 33.968(4.25) + (35.967)(0.01)}{100}$$

$4.25\%(33.968) + .75\%(32.971) + 94.99\%(31.972) + .01\%(35.967)$

Note: Do *not* allow credit for a numerical setup using mass numbers rather than isotopic masses.

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

The energy of an electron in the third shell is higher than the energy of an electron in the first shell.

The third shell electron has higher energy.

The electron in the first shell has less.

Note: The student response must address energy of electrons, not just shells.

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

The NaCl is soluble in water, and the rock particles are insoluble.

The mixture can be separated by filtration.

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

The particles of the rock are much larger than the openings in the filter paper.

The rock particles are too big to pass through the paper.

56 [1] Allow 1 credit for 4 *or* four.

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

$$\frac{(240.0\text{ g} - 224.2\text{ g})}{16.4\text{ g}} \times 100$$

$$\frac{(100)(15.8)}{16.4}$$

$$\frac{16.4 - 0.6}{16.4} \times 100$$

$$\frac{15.8}{16.4} = \frac{x}{100}$$

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

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

The gas in cylinder *A* has a smaller mass than the mass of the gas in cylinder *B*.

The nitrogen gas has more mass.

The $H_2(g)$ in cylinder *A* has less mass.

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

Temperature: increase

Pressure: decrease

Temperature: above 25°C

Pressure: below 1.00 atm

Temperature: any temperature above 298 K

Pressure: any pressure below 101.3 kPa

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

Moving the piston farther into the cylinder would increase the number of collisions per unit area between the nitrogen molecules and the inside walls of the cylinder, creating greater pressure.

There would be more collisions, causing a higher pressure.

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

$$\frac{(101.3\text{ kPa})(500.\text{ mL})}{298\text{ K}} = \frac{(101.3\text{ kPa})(V_2)}{273\text{ K}}$$

$$\frac{(500\text{ mL})(273\text{ K})}{298\text{ K}}$$

$$\frac{(500)(273)}{298}$$

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

There is a greater concentration of ions present in the 6.0 M HCl(aq) than in the 0.1 M HCl(aq).

The 6.0 M HCl(aq) has a higher concentration of ions.

Note: Do *not* allow credit for "more ions" because it is not in terms of concentrations of ions.

63 [1] Allow 1 credit for C or carbon.

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

$^{30}_{14}\text{Si}$

^{30}Si

silicon-30

Si-30

65 [1] Allow 1 credit for 28.56 d. Significant figures do *not* need to be shown.

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 Ar in the sample did not react, and the nitrogen did.

Magnesium reacted with the nitrogen gas, and the argon gas did not react.

Nitrogen is more reactive.

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

The density of nitrogen gas is less than the density of argon gas.

Argon is more dense.

Nitrogen gas has a density of 0.001145 g/cm^3, which is less than the density of argon.

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

Their atoms have the same number of valence electrons.

These elements have similar chemical properties because their atoms have valence electron shells with a complete octet.

Their outermost shells have 8 e^-.

They have a full outermost shell of electrons.

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

As the atomic number of these elements increases, their boiling points increase.

Boiling point goes up as atomic number gets larger.

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

10

ten

tenfold

10 times

71 [1] Allow 1 credit for yellow.

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

As the water temperature increases, the solubility of sulfur dioxide decreases.

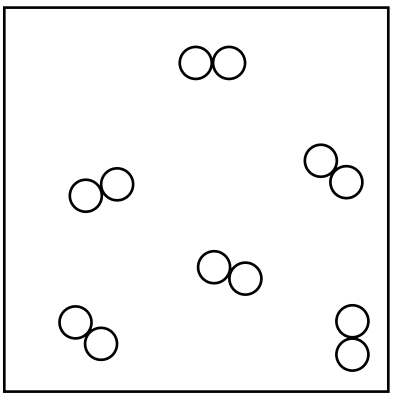
The solubility of SO_2 decreases.

The $SO_2(g)$ becomes less soluble.

73 [1] Allow 1 credit for CH *or* HC.

74 [1] Allow 1 credit for a diagram with *at least six* diatomic molecules drawn to represent the gas phase of the sample.

Example of a 1-credit response:



75 [1] Allow 1 credit for

$$\underline{2}\ C_2H_2(g) + \underline{5}\ O_2(g) \rightarrow \underline{4}\ CO_2(g) + \underline{2}\ H_2O(g) + \text{heat}$$

76 [1] Allow 1 credit for 650 g *or* any value from 650 g to 651 g, inclusive.

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

Each molecule has a triple carbon-to-carbon bond, C≡C.

The two C atoms share 6 electrons.

Each molecule has a triple bond.

Alkynes have a C≡C.

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

The thermal energy is greater for the 1000 g sample of water.

The smaller sample has less thermal energy.

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

The potential energy increases.

P.E. goes up.

80 [1] Allow 1 credit for any value from 28 kPa to 30. kPa, inclusive.

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

Hexane molecules are nonpolar, and water molecules are polar.

Water and hexane have different molecular polarities.

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

The hexane and the 2,2-dimethylhexane have the same molecular formula but have different structural formulas.

Both molecules have the same number of C atoms and the same number of H atoms but have a different arrangement of atoms.

Both compounds are C_6H_{14}, but have different structures.

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

From −2 to 0

From 2− to 0

From negative two to zero

Note: Do *not* allow credit for 2 without a minus sign (−).

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

The number of electrons lost by oxygen is equal to the number of electrons gained by hydrogen.

The same number of electrons is lost and gained.

equal

same

85 [1] Allow 1 credit for 0.0008 mol *or* 8×10^{-4} mol. Significant figures do *not* need to be shown.

Regents Examination in Physical Setting/Chemistry

January 2020

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

The *Chart for Determining the Final Examination Score for the January 2020 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ on Friday, January 24, 2020. 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 2020 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		52, 56, 57, 61	
Math Key Idea 2		41, 48	70, 79
Math Key Idea 3		35, 36, 37, 40, 47, 51, 64, 65	73, 75, 76, 83, 85
Science Inquiry Key Idea 1		34, 45, 46, 50, 51, 53, 54, 55, 58, 59, 60, 62, 63, 64	66, 67, 68, 69, 77, 81, 82, 84
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		31, 36, 37, 39, 42, 43, 46, 48, 49, 50, 63	66, 67, 73, 77, 80, 82, 83
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1		54	
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1			
Key Idea 2		35	74
Key Idea 3			70
Key Idea 4			
Key Idea 5			72, 80
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		32, 33, 38, 39, 42, 45, 46, 47, 49, 51, 52, 59,61	69, 71, 72, 73, 74, 75, 76, 85
Key Idea 4		44, 50, 64, 65	78, 79
Key idea 5		40, 62	
Standard 4			
Key Idea 3	1, 2, 3, 4, 5, 6, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29	31, 32, 33, 35, 36, 37, 38, 39, 41, 42, 43, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63	66, 67, 68, 69,70, 71, 72, 73, 74, 75, 76, 77, 82, 83, 84, 85
Key Idea 4	13, 27, 30	44, 50, 64, 65	78, 79
Key Idea 5	7, 8, 9, 10, 14, 28	34, 40	80, 81
Reference Tables			
2011 Edition	4, 5, 6, 9, 10, 13, 18, 20, 24, 27, 29	32, 33, 35, 36, 40, 43, 46, 47, 48, 50, 51, 53, 57, 58, 59, 61, 64, 65	66, 67, 68, 69, 71, 72, 76, 77, 80, 82, 83