FOR TEACHERS ONLY

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

PHYSICAL SETTING/CHEMISTRY

Thursday, June 20, 2024 — 1:15 to 4:15 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: https://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: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Thursday, June 20, 2024. 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:

The unknown element's spectrum seen in the spectroscope is matched to lines on a chart of known element spectra.

The unknown element's spectral lines are compared to the known bright-line spectra.

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

Match the spectral wavelengths of the unknown element to those of a known element.

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

A second shell electron has moved to the third shell.

A lower shell electron is shown in a higher shell.

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

53 [1] Allow 1 credit. The position of electrons may vary.

Examples of 1-credit responses:

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

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

In an atom of silicon, an electron in the third energy level has more energy than an electron the first energy level.

Electrons in shell three have higher energies than shell one electrons.

lower in first shell

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

$(27.98\text{ u})(0.9222) + (28.98\text{ u})(0.0469) + (29.97\text{ u})(0.0309)$

$$\frac{(27.98)(92.22) + (28.98)(4.69) + (29.97)(3.09)}{100}$$

$(27.98)(92.22\%) + (28.98)(4.69\%) + (29.97)(3.09\%)$

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

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

There are two reactants that form one product.

Two substances made one compound.

57 [1] Allow 1 credit for $\_\_2\_\_\ NO(g) + \_\_\_\_\ O_2(g) \rightarrow \_\_2\_\_\ NO_2(g)$

Allow credit even if the coefficient "1" is written in front of $O_2(g)$.

58 [1] Allow 1 credit for 70.% *or* for any value from 69.55% to 70.%, inclusive.

59 [1] Allow 1 credit for Kr *or* krypton.

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

The valence electron shell of a Group 17 atom gains an electron when it becomes an ion.

A Group 17 ion has one more electron than the atom from which it was formed.

The ion has more electrons.

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

The molecules of gas in container *B* require more energy to reach their boiling point because they have stronger intermolecular forces.

The gas in container *B* has stronger intermolecular forces, causing a higher boiling point.

The N_2 molecules have weaker intermolecular forces.

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

$$\frac{(101.3\text{ kPa})(750.\text{ mL})}{298\text{ K}} = \frac{x(750.\text{ mL})}{273\text{ K}}$$

$$\frac{(101.3\text{ kPa})(273\text{ K})}{298\text{ K}}$$

$$\frac{(101.3)(750)(273)}{(750)(298)}$$

$$\frac{101.3}{298} = \frac{P_2}{273}$$

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

64 [1] Allow 1 credit for ester *or* esters.

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

propanoic acid

propionic acid

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:

oganesson

Og

Element 118

Uuo

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

Since Nh is in Group 13 and Ts is in group 17, their atoms do not have the same number of valence electrons and would differ in their chemical properties.

Because nihonium atoms would have three valence electrons and tennessine atoms would have seven valence electrons, they would have different chemical properties.

Atoms of these two elements do not have the same number of electrons in their outermost electron shells.

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

The first ionization energy values decrease as the elements in Group 15 above Mc are considered in order of increasing atomic number.

The first ionization energy decreases.

decreases

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

Atoms of tennessine have 117 protons and atoms of oganesson have 118 protons.

Elements on the Periodic Table of the Elements are arranged in order of increasing atomic number, which is the number of protons in their atoms.

The Ts atoms have one less proton.

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

In equation 1, the rate of the forward reaction equals the rate of the reverse reaction at equilibrium.

The forward reaction and the reverse reaction have the same rate.

Both reactions have equal rates.

equal

same

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

The equilibrium shifts to favor the products of the forward reaction.

shifts to the right

The forward reaction is favored.

The production of CO(g) and H_2 (g) is favored.

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

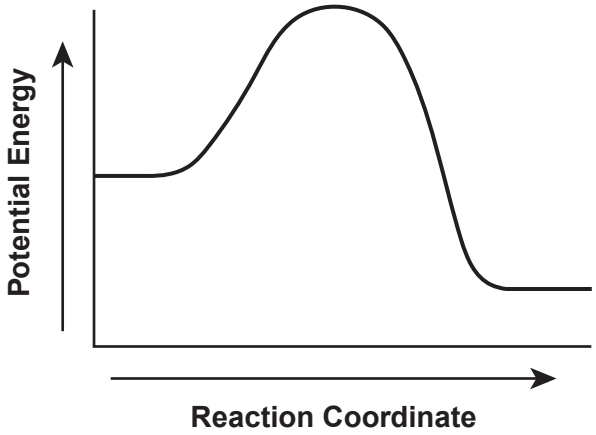
The activation energy for the forward reaction is lower when the catalyst is used.

There is less activation energy for the reaction.

activation energy lower with an alternative pathway

73 [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:



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

chemical potential energy

chemical

potential

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

Co

Ni

tin

lead

Note: Do *not* allow credit for H_2 *or* H *or* hydrogen.

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

The salt bridge allows the movement of ions between the half-cells.

The salt bridge prevents polarization of the half-cells.

Electrical neutrality of the solutions is maintained.

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

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

$Cu^{+2} + 2e^- \rightarrow Cu$

Note: Do *not* allow credit for the e without the minus sign (−).

78 [1] Allow 1 credit for blue.

79 [1] Allow 1 credit for 10.00 *or* 10.0 *or* 10 *or* ten.

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

hydronium ion	H_3O^+
hydronium	H^+
hydrogen ion	$H_3O^+(aq)$
hydrogen	$H^+(aq)$

Note: Do *not* allow credit for H *or* H_2

81 [1] Allow 1 credit for 0.020 M *or* .02 M.

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

$\frac{1}{4}$

0.250

25%

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

The penetrating power of alpha particles is weaker than the penetrating power of the gamma radiation.

Gamma rays have greater penetrating power.

The $^{4}_{2}He$ is less penetrating.

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

$^{234}_{92}U$

U-234

uranium-234

^{234}U

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

The radioactive decay of 1.0 kg of Pu-238 releases much more energy than 1.0 kilogram of chemical reactants in a battery.

The energy released during the chemical reaction is less than the energy released during the nuclear reaction.

greater for plutonium-238

Regents Examination in Physical Setting/Chemistry

June 2024

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

The *Chart for Determining the Final Examination Score for the June 2024 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: https://www.nysed.gov/state-assessment/high-school-regents-examinations on Thursday, June 20, 2024. 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

June 2024 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		32, 36, 39, 55, 62	
Math Key Idea 2		38, 42	
Math Key Idea 3		31, 35, 39, 41, 45, 57, 58	77, 79, 81, 82, 84
Science Inquiry Key Idea 1		31, 46, 47, 48, 49, 51, 52, 54, 56, 59, 60, 61, 63, 64, 65	66, 67, 68, 69, 70, 72, 74, 75, 76, 83, 85
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		31, 33, 37, 38, 45, 46, 47, 48, 49, 50, 52, 53, 56, 57, 59	67, 69, 75, 76, 78, 80, 84
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1		40	
Key Idea 2		53, 64, 73	
Key Idea 3		79	
Key Idea 4		71	
Key Idea 5		35, 42	
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		31, 34, 35, 36, 38, 39, 43, 44, 47, 49, 51, 52, 53, 55, 57, 62, 64	66, 68, 70, 71, 75, 77, 78, 81
Key Idea 4		41, 42, 50	73, 82, 84
Key idea 5		59, 61	
Standard 4			
Key Idea 3	1, 2, 3, 4, 5, 7, 8, 9, 10, 16, 17, 18, 19, 20, 21, 22, 25, 26, 28, 29	31, 32, 33, 34, 35, 36, 37, 38, 39, 43, 44, 45, 46, 47, 48, 51, 52, 53, 54, 55, 56, 57, 58, 62, 63, 64, 65	66, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80, 81, 83
Key Idea 4	30	40, 41, 42, 49, 50	73, 82, 84
Key Idea 5	6, 11, 12, 13, 14, 15, 23, 24, 27	59, 60, 61	85
Reference Tables			
2011 Edition	7, 11, 12, 19, 23, 27, 29	33, 35, 36, 37, 38, 39, 41, 43, 45, 47, 48, 49, 52, 53, 55, 58, 59, 60, 62, 64, 65	66, 67, 68, 69, 75, 78, 80, 81, 83, 84