

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

# PHYSICAL SETTING CHEMISTRY

Wednesday, August 13, 2008 — 12:30 to 3:30 p.m., only

This is a test of your knowledge of chemistry. Use that knowledge to answer all questions in this examination. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*. You are to answer *all* questions in all parts of this examination according to the directions provided in the examination booklet.

Your answer sheet for Part A and Part B–1 is the last page of this examination booklet. Turn to the last page and fold it along the perforations. Then, slowly and carefully, tear off your answer sheet and fill in the heading.

The answers to the questions in Part B–2 and Part C are to be written in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

Record the number of your choice for each Part A and Part B–1 multiple-choice question on your separate answer sheet. Write your answers to the Part B–2 and Part C questions in your answer booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on your separate answer sheet and in your answer booklet.

When you have completed the examination, you must sign the statement printed at the end of your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and answer booklet cannot be accepted if you fail to sign this declaration.

Notice . . .

A four-function or scientific calculator and a copy of the *Reference Tables for Physical Setting/Chemistry* must be available for you to use while taking this examination.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

**DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.**

## Part A

### Answer all questions in this part.

*Directions (1–30):* For *each* statement or question, write on the separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

- In the wave-mechanical model of the atom, orbitals are regions of the most probable locations of
  - protons
  - positrons
  - neutrons
  - electrons
- Which phrase describes an atom?
  - a positively charged electron cloud surrounding a positively charged nucleus
  - a positively charged electron cloud surrounding a negatively charged nucleus
  - a negatively charged electron cloud surrounding a positively charged nucleus
  - a negatively charged electron cloud surrounding a negatively charged nucleus
- Which total mass is the *smallest*?
  - the mass of 2 electrons
  - the mass of 2 neutrons
  - the mass of 1 electron plus the mass of 1 proton
  - the mass of 1 neutron plus the mass of 1 electron
- Elements on the modern Periodic Table are arranged in order of increasing
  - atomic mass
  - atomic number
  - number of neutrons
  - number of valence electrons
- As the elements of Group 17 are considered in order of increasing atomic number, there is an increase in
  - atomic radius
  - electronegativity
  - first ionization energy
  - number of electrons in the first shell
- Chlorine-37 can be represented as
  - ${}_{35}^{17}\text{Cl}$
  - ${}_{37}^{20}\text{Cl}$
  - ${}_{20}^{35}\text{Cl}$
  - ${}_{17}^{37}\text{Cl}$
- Which element is a metal that is in the liquid phase at STP?
  - bromine
  - cobalt
  - hydrogen
  - mercury
- Which list of formulas represents compounds, only?
  - $\text{CO}_2$ ,  $\text{H}_2\text{O}$ ,  $\text{NH}_3$
  - $\text{H}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$
  - $\text{H}_2$ , Ne, NaCl
  - $\text{MgO}$ , NaCl,  $\text{O}_2$
- What is the chemical formula for iron(III) oxide?
  - $\text{FeO}$
  - $\text{Fe}_2\text{O}_3$
  - $\text{Fe}_3\text{O}$
  - $\text{Fe}_3\text{O}_2$
- An atom of which element has the greatest attraction for the electrons in a bond with a hydrogen atom?
  - chlorine
  - phosphorus
  - silicon
  - sulfur
- Which property could be used to identify a compound in the laboratory?
  - mass
  - melting point
  - temperature
  - volume
- Which statement describes what occurs as two atoms of bromine combine to become a molecule of bromine?
  - Energy is absorbed as a bond is formed.
  - Energy is absorbed as a bond is broken.
  - Energy is released as a bond is formed.
  - Energy is released as a bond is broken.



- 24 Which half-reaction correctly represents reduction?
- (1)  $\text{Mn}^{4+} \rightarrow \text{Mn}^{3+} + \text{e}^-$
  - (2)  $\text{Mn}^{4+} \rightarrow \text{Mn}^{7+} + 3\text{e}^-$
  - (3)  $\text{Mn}^{4+} + \text{e}^- \rightarrow \text{Mn}^{3+}$
  - (4)  $\text{Mn}^{4+} + 3\text{e}^- \rightarrow \text{Mn}^{7+}$
- 25 Which indicator is blue in a solution that has a pH of 5.6?
- (1) bromocresol green
  - (2) bromthymol blue
  - (3) methyl orange
  - (4) thymol blue
- 26 The Arrhenius theory explains the behavior of
- (1) acids and bases
  - (2) alcohols and amines
  - (3) isomers and isotopes
  - (4) metals and nonmetals
- 27 In which laboratory process could a student use 0.10 M NaOH(aq) to determine the concentration of an aqueous solution of HBr?
- (1) chromatography
  - (2) decomposition of the solute
  - (3) evaporation of the solvent
  - (4) titration
- 28 A nuclear reaction in which two light nuclei combine to form a more massive nucleus is called
- (1) addition
  - (2) fission
  - (3) fusion
  - (4) substitution
- 29 The nucleus of a radium-226 atom is unstable, which causes the nucleus to spontaneously
- (1) absorb electrons
  - (2) absorb protons
  - (3) decay
  - (4) oxidize
- 30 A serious risk factor associated with the operation of a nuclear power plant is the production of
- (1) acid rain
  - (2) helium gas
  - (3) greenhouse gases, such as  $\text{CO}_2$
  - (4) radioisotopes with long half-lives

Part B-1

Answer all questions in this part.

Directions (31–50): For each statement or question, write on the separate answer sheet the number of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

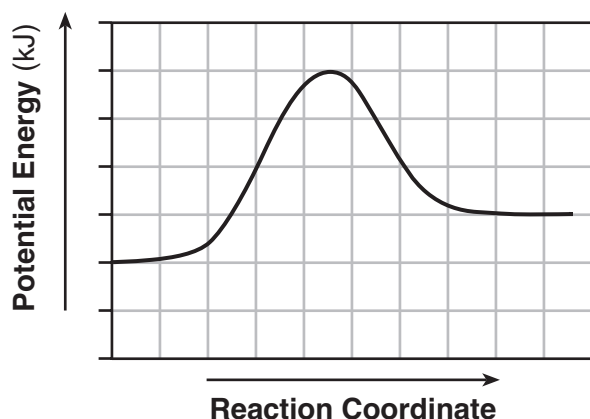
- 31 What is the total number of protons in an atom with the electron configuration 2-8-18-32-18-1?  
(1) 69 (3) 118  
(2) 79 (4) 197
- 32 Which two elements have the most similar chemical properties?  
(1) Be and Mg (3) Cl and Ar  
(2) Ca and Br (4) Na and P
- 33 In the ground state, each atom of an element has two valence electrons. This element has a lower first ionization energy than calcium. Where is this element located on the Periodic Table?  
(1) Group 1, Period 4 (3) Group 2, Period 3  
(2) Group 2, Period 5 (4) Group 3, Period 4
- 34 Which equation shows conservation of mass and charge?  
(1)  $\text{NH}_4\text{Br} \rightarrow \text{NH}_3 + \text{Br}_2$   
(2)  $2\text{Mg} + \text{Fe}^{3+} \rightarrow \text{Mg}^{2+} + 3\text{Fe}$   
(3)  $\text{H}_2\text{SO}_4 + \text{LiOH} \rightarrow \text{Li}_2\text{SO}_4 + \text{H}_2\text{O}$   
(4)  $\text{Cu} + 2\text{Ag}^+ \rightarrow \text{Cu}^{2+} + 2\text{Ag}$
- 35 What is the percent composition by mass of hydrogen in  $\text{NH}_4\text{HCO}_3$  (gram-formula mass = 79 grams/mole)?  
(1) 5.1% (3) 10.%  
(2) 6.3% (4) 50.%
- 36 What is the total number of valence electrons in a sulfide ion in the ground state?  
(1) 8 (3) 16  
(2) 2 (4) 18
- 37 A temperature of  $37^\circ\text{C}$  is equivalent to a temperature of  
(1) 98.6 K (3) 310. K  
(2) 236 K (4) 371 K
- 38 Which balanced equation represents a chemical change?  
(1)  $\text{H}_2\text{O}(\ell) + \text{energy} \rightarrow \text{H}_2\text{O}(\text{g})$   
(2)  $2\text{H}_2\text{O}(\ell) + \text{energy} \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$   
(3)  $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s}) + \text{energy}$   
(4)  $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\ell) + \text{energy}$
- 39 When 5 grams of KCl are dissolved in 50. grams of water at  $25^\circ\text{C}$ , the resulting mixture can be described as  
(1) heterogeneous and unsaturated  
(2) heterogeneous and supersaturated  
(3) homogeneous and unsaturated  
(4) homogeneous and supersaturated
- 40 Which aqueous solution of KI freezes at the lowest temperature?  
(1) 1 mol of KI in 500. g of water  
(2) 2 mol of KI in 500. g of water  
(3) 1 mol of KI in 1000. g of water  
(4) 2 mol of KI in 1000. g of water
- 41 Which compound is a member of the same homologous series as  $\text{C}_3\text{H}_8$ ?  
(1)  $\text{CH}_4$  (3)  $\text{C}_5\text{H}_8$   
(2)  $\text{C}_4\text{H}_8$  (4)  $\text{C}_5\text{H}_{10}$
- 42 Which equation represents an oxidation-reduction reaction?  
(1)  $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$   
(2)  $\text{H}_2\text{SO}_4 + \text{Ca}(\text{OH})_2 \rightarrow \text{CaSO}_4 + 2\text{H}_2\text{O}$   
(3)  $\text{MgCrO}_4 + \text{BaCl}_2 \rightarrow \text{MgCl}_2 + \text{BaCrO}_4$   
(4)  $\text{Zn}(\text{NO}_3)_2 + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaNO}_3 + \text{ZnCO}_3$

- 43 Given the balanced equation representing a reaction:



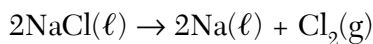
The oxidation state of chlorine in this reaction changes from

- (1) -1 to +1                      (3) +1 to -1  
 (2) -1 to +5                      (4) +5 to -1
- 44 The potential energy diagram for a chemical reaction is shown below.



Each interval on the axis labeled "Potential Energy (kJ)" represents 40 kilojoules. What is the heat of reaction?

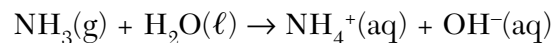
- (1) -120 kJ                      (3) +40 kJ  
 (2) -40 kJ                      (4) +160 kJ
- 45 Given the balanced equation representing a reaction occurring in an electrolytic cell:



Where is  $\text{Na}(\ell)$  produced in the cell?

- (1) at the anode, where oxidation occurs  
 (2) at the anode, where reduction occurs  
 (3) at the cathode, where oxidation occurs  
 (4) at the cathode, where reduction occurs

- 46 Given the balanced equation representing a reaction:



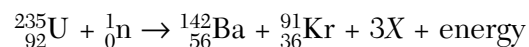
According to one acid-base theory, the  $\text{NH}_3(\text{g})$  molecules act as

- (1) an acid because they accept  $\text{H}^+$  ions  
 (2) an acid because they donate  $\text{H}^+$  ions  
 (3) a base because they accept  $\text{H}^+$  ions  
 (4) a base because they donate  $\text{H}^+$  ions

- 47 What volume of 0.120 M  $\text{HNO}_3(\text{aq})$  is needed to completely neutralize 150.0 milliliters of 0.100 M  $\text{NaOH}(\text{aq})$ ?

- (1) 62.5 mL                      (3) 180. mL  
 (2) 125 mL                      (4) 360. mL

- 48 Given the balanced equation representing a nuclear reaction:



Which particle is represented by X?

- (1)  ${}_{-1}^0\text{e}$                       (3)  ${}_{2}^4\text{He}$   
 (2)  ${}_{1}^1\text{H}$                       (4)  ${}_{0}^1\text{n}$

- 49 An original sample of the radioisotope fluorine-21 had a mass of 80.0 milligrams. Only 20.0 milligrams of this original sample remain unchanged after 8.32 seconds. What is the half-life of fluorine-21?

- (1) 1.04 s                      (3) 4.16 s  
 (2) 2.08 s                      (4) 8.32 s

- 50 Which nuclide is paired with a specific use of that nuclide?

- (1) carbon-14, treatment of cancer  
 (2) cobalt-60, dating of rock formations  
 (3) iodine-131, treatment of thyroid disorders  
 (4) uranium-238, dating of once-living organisms

## Part B–2

### Answer all questions in this part.

*Directions (51–65):* Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

- 51 Identify *one* ion from Table F that can combine with  $\text{Pb}^{2+}(\text{aq})$  to produce an insoluble compound. [1]
- 52 Describe *one* appropriate laboratory test that can be used to determine the malleability of a solid sample of an element at room temperature. [1]
- 53 State *two* methods to increase the rate of a chemical reaction and explain, in terms of particle behavior, how *each* method increases the reaction rate. [2]

Base your answers to questions 54 through 57 on the information below.

#### Naturally Occurring Isotopes of Copper

Isotope Notation	Percent Natural Abundance (%)	Atomic Mass (atomic mass units, u)
Cu-63	69.17	62.930
Cu-65	30.83	64.928

- 54 State, in terms of subatomic particles, how an atom of Cu-63 differs from an atom of Cu-65. [1]
- 55 What is the total number of electrons in an atom of Cu-65? [1]
- 56 The atomic mass of Cu-63 is expressed to what number of significant figures? [1]
- 57 In the space *in your answer booklet*, show a correct numerical setup for calculating the atomic mass of copper. [1]
-





Base your answers to questions 63 through 65 on the information below.

A piece of magnesium ribbon is reacted with excess hydrochloric acid to produce aqueous magnesium chloride and hydrogen gas. The volume of the dry hydrogen gas produced is 45.6 milliliters. The temperature of the gas is 293 K, and the pressure is 99.5 kilopascals.

- 63 Balance the equation *in your answer booklet*, using the smallest whole-number coefficients. [1]
- 64 Identify the type of bond between the atoms in a molecule of the gas produced in this laboratory investigation. [1]
- 65 Calculate the volume this dry hydrogen gas would occupy at STP. Your response must include *both* a correct numerical setup and the calculated result. [2]
-

## Part C

### Answer all questions in this part.

*Directions (66–80):* Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

Base your answers to questions 66 through 69 on the information below.

In a laboratory, a glass tube is filled with hydrogen gas at a very low pressure. When a scientist applies a high voltage between metal electrodes in the tube, light is emitted. The scientist analyzes the light with a spectroscope and observes four distinct spectral lines. The table below gives the color, frequency, and energy for each of the four spectral lines. The unit for frequency is hertz, Hz.

**Visible Spectrum of Hydrogen**

<b>Color</b>	<b>Frequency (<math>\times 10^{14}</math> Hz)</b>	<b>Energy (<math>\times 10^{-19}</math> J)</b>
red	4.6	3.0
blue green	6.2	4.1
blue	6.9	4.6
violet	7.3	4.8

- 66 On the grid *in your answer booklet*, plot the data from the data table for frequency and energy. Circle and connect the points, including the point (0,0) that has already been plotted and circled for you. [1]
- 67 A spectral line in the infrared region of the spectrum of hydrogen has a frequency of  $2.3 \times 10^{14}$  hertz. Using your graph, estimate the energy associated with this spectral line. [1]
- 68 Explain, in terms of subatomic particles and energy states, why light is emitted by the hydrogen gas. [1]
- 69 Identify *one* condition *not* mentioned in the passage, under which hydrogen gas behaves most like an ideal gas. [1]
-

Base your answers to questions 70 through 72 on the information below.

Carbon and oxygen are examples of elements that exist in more than one form in the same phase.

Graphite and diamond are two crystalline arrangements for carbon. The crystal structure of graphite is organized in layers. The bonds between carbon atoms within each layer of graphite are strong. The bonds between carbon atoms that connect different layers of graphite are weak because the shared electrons in these bonds are loosely held by the carbon atoms. The crystal structure of diamond is a strong network of atoms in which all the shared electrons are strongly held by the carbon atoms. Graphite is an electrical conductor, but diamond is not. At 25°C, graphite has a density of 2.2 g/cm<sup>3</sup> and diamond has a density of 3.51 g/cm<sup>3</sup>.

The element oxygen can exist as diatomic molecules, O<sub>2</sub>, and as ozone, O<sub>3</sub>. At standard pressure the boiling point of ozone is 161 K.

- 70 Explain, in terms of electrons, why graphite is an electrical conductor and diamond is *not*. Your response must include information about *both* graphite and diamond. [1]
- 71 Calculate the volume, in cm<sup>3</sup>, of a diamond at 25°C that has a mass of 0.200 gram. Your response must include *both* a correct numerical setup and the calculated result. [2]
- 72 Explain, in terms of intermolecular forces, the difference in the boiling points of O<sub>2</sub> and O<sub>3</sub> at standard pressure. Your response must include information about *both* O<sub>2</sub> and O<sub>3</sub>. [1]
-

Base your answers to questions 73 through 76 on the information below.

A portable propane-fueled lantern contains a mesh silk bag coated with metal hydroxides. The primary metal hydroxide is yttrium hydroxide. When the silk bag is installed, it is ignited and burned away, leaving the metal hydroxide coating. The coating forms metal oxides that glow brightly when heated to a high temperature.

During a test, a propane lantern is operated for three hours and consumes 5.0 moles of propane from the lantern's tank. The balanced equation below represents the combustion of propane.



- 73 At standard pressure, the boiling point of propane is 231 K. In the box *in your answer booklet*, draw a particle diagram to represent the phase of the propane as it leaves the tank at 294 K. Your response must include *at least six* molecules. [1]
- 74 Calculate the total mass of propane consumed during the lantern test. Your response must include *both* a correct numerical setup and the calculated result. [2]
- 75 Determine the total number of moles of  $\text{CO}_2$  produced during the lantern test. [1]
- 76 Write the formula for the primary metal hydroxide used in the lantern. [1]
- 

Base your answers to questions 77 through 80 on the information below.

When a person perspires (sweats), the body loses many sodium ions and potassium ions. The evaporation of sweat cools the skin.

After a strenuous workout, people often quench their thirst with sports drinks that contain NaCl and KCl. A single 250.-gram serving of one sports drink contains 0.055 gram of sodium ions.

- 77 In the space *in your answer booklet*, show a correct numerical setup for calculating the concentration of sodium ions in this sports drink, expressed as percent by mass. [1]
- 78 Describe the transfer of energy between the skin and the surroundings as a person perspires and the sweat evaporates. [1]
- 79 State why the salts in sports drinks are classified as electrolytes. [1]
- 80 In the space *in your answer booklet*, draw a Lewis electron-dot diagram for *one* of the positive ions lost by the body as a person perspires. [1]
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The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING CHEMISTRY

Wednesday, August 13, 2008 — 12:30 to 3:30 p.m., only

ANSWER SHEET

Student ..... Sex:  Male  Female Grade .....

Teacher ..... School .....

Record your answers to Part A and Part B-1 on this answer sheet.

Part A

- 1 ..... 11 ..... 21 .....
2 ..... 12 ..... 22 .....
3 ..... 13 ..... 23 .....
4 ..... 14 ..... 24 .....
5 ..... 15 ..... 25 .....
6 ..... 16 ..... 26 .....
7 ..... 17 ..... 27 .....
8 ..... 18 ..... 28 .....
9 ..... 19 ..... 29 .....
10 ..... 20 ..... 30 .....

Part A Score

[Box for Part A Score]

Part B-1

- 31 ..... 41 .....
32 ..... 42 .....
33 ..... 43 .....
34 ..... 44 .....
35 ..... 45 .....
36 ..... 46 .....
37 ..... 47 .....
38 ..... 48 .....
39 ..... 49 .....
40 ..... 50 .....

Part B-1 Score

[Box for Part B-1 Score]

Write your answers to Part B-2 and Part C in your answer booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

Tear Here

# PHYSICAL SETTING CHEMISTRY

Wednesday, August 13, 2008 — 12:30 to 3:30 p.m., only

## ANSWER BOOKLET

Student ..... Sex:  Male  
 Female

Teacher .....

School ..... Grade .....

Answer all questions in Part B-2 and Part C. Record your answers  
in this booklet.

Part	Maximum Score	Student's Score
A	30	
B-1	20	
B-2	18	
C	17	
Total Written Test Score (Maximum Raw Score: 85)		<input type="text"/>
Final Score (from conversion chart)		<input type="text"/>
Raters' Initials:		
Rater 1 ..... Rater 2 .....		

Part B-2		For Raters Only
51	_____	51 <input type="text"/>
52	_____ _____	52 <input type="text"/>
53	Method and explanation 1: _____ _____ _____	53 <input type="text"/>
	Method and explanation 2: _____ _____ _____	

**For Raters  
Only**

54 \_\_\_\_\_

54

\_\_\_\_\_

55 \_\_\_\_\_

55

56 \_\_\_\_\_

56

57

57

58 \_\_\_\_\_ °C

58

59

59

\_\_\_\_\_ J

**For Raters  
Only**

60 \_\_\_\_\_

60

61 \_\_\_\_\_

61

62

62

63 \_\_\_\_\_ Mg(s) + \_\_\_\_\_ HCl(aq) → \_\_\_\_\_ MgCl<sub>2</sub>(aq) + \_\_\_\_\_ H<sub>2</sub>(g)

63

64 \_\_\_\_\_

64

65

65

\_\_\_\_\_ mL

**Total Score  
for Part B-2**

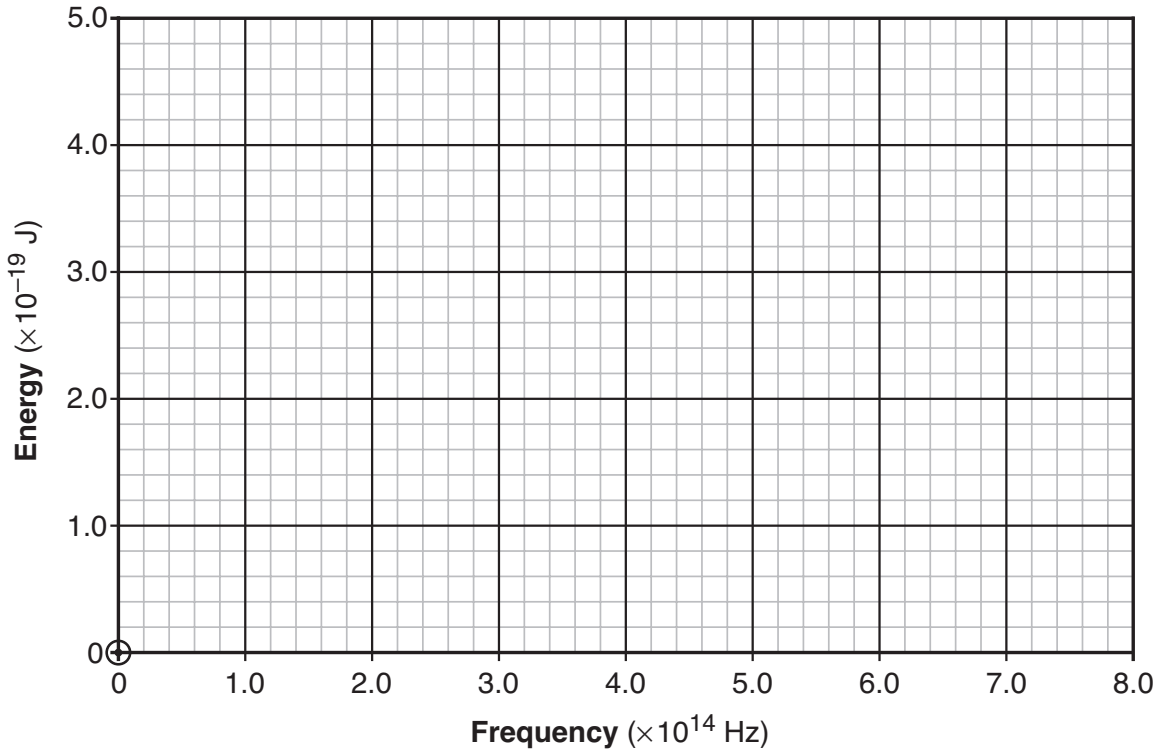


Part C

For Raters Only

66

Light Energy Versus Frequency



66

67 \_\_\_\_\_  $\times 10^{-19}$  J

67

68 \_\_\_\_\_

68

\_\_\_\_\_

\_\_\_\_\_

69 \_\_\_\_\_

69

**For Raters Only**

**70**

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**70**

**71**

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\_\_\_\_\_ **cm<sup>3</sup>**

**71**

**72**

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**72**

For Raters  
Only

73

Key
○ = propane molecule



73

74

74

\_\_\_\_\_ g

75 \_\_\_\_\_ mol

75

76 \_\_\_\_\_

76

**For Raters  
Only**

77

77

78

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78

79

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79

80

80

**Total Score  
for Part C**

# FOR TEACHERS ONLY

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

# PS-CH

## PHYSICAL SETTING/CHEMISTRY

Wednesday, August 13, 2008 — 12:30 to 3:30 p.m., only

### SCORING KEY AND RATING GUIDE

**Directions to the Teacher:**

Refer to the directions on page 3 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 <http://www.emsc.nysed.gov/osa/> and select the link "Examination 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			Part B-1	
1 . . . . . <b>4</b> . . . . .	11 . . . . . <b>2</b> . . . . .	21 . . . . . <b>2</b> . . . . .	31 . . . . . <b>2</b> . . . . .	41 . . . . . <b>1</b> . . . . .
2 . . . . . <b>3</b> . . . . .	12 . . . . . <b>3</b> . . . . .	22 . . . . . <b>1</b> . . . . .	32 . . . . . <b>1</b> . . . . .	42 . . . . . <b>1</b> . . . . .
3 . . . . . <b>1</b> . . . . .	13 . . . . . <b>4</b> . . . . .	23 . . . . . <b>2</b> . . . . .	33 . . . . . <b>2</b> . . . . .	43 . . . . . <b>4</b> . . . . .
4 . . . . . <b>2</b> . . . . .	14 . . . . . <b>4</b> . . . . .	24 . . . . . <b>3</b> . . . . .	34 . . . . . <b>4</b> . . . . .	44 . . . . . <b>3</b> . . . . .
5 . . . . . <b>1</b> . . . . .	15 . . . . . <b>3</b> . . . . .	25 . . . . . <b>1</b> . . . . .	35 . . . . . <b>2</b> . . . . .	45 . . . . . <b>4</b> . . . . .
6 . . . . . <b>4</b> . . . . .	16 . . . . . <b>4</b> . . . . .	26 . . . . . <b>1</b> . . . . .	36 . . . . . <b>1</b> . . . . .	46 . . . . . <b>3</b> . . . . .
7 . . . . . <b>4</b> . . . . .	17 . . . . . <b>1</b> . . . . .	27 . . . . . <b>4</b> . . . . .	37 . . . . . <b>3</b> . . . . .	47 . . . . . <b>2</b> . . . . .
8 . . . . . <b>1</b> . . . . .	18 . . . . . <b>3</b> . . . . .	28 . . . . . <b>3</b> . . . . .	38 . . . . . <b>2</b> . . . . .	48 . . . . . <b>4</b> . . . . .
9 . . . . . <b>2</b> . . . . .	19 . . . . . <b>2</b> . . . . .	29 . . . . . <b>3</b> . . . . .	39 . . . . . <b>3</b> . . . . .	49 . . . . . <b>3</b> . . . . .
10 . . . . . <b>1</b> . . . . .	20 . . . . . <b>3</b> . . . . .	30 . . . . . <b>4</b> . . . . .	40 . . . . . <b>2</b> . . . . .	50 . . . . . <b>3</b> . . . . .

**Directions to the Teacher**

Follow the procedures below for scoring student answer papers for the Physical Setting/Chemistry examination. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences*.

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* correct the student's work by making insertions or changes of any kind.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a check mark each incorrect or omitted answer. In the box provided at the end of each part, record the number of questions the student answered correctly for that part.

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. 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 all the open-ended questions on a student's answer paper.

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. Complete sentences are *not* required. Phrases, diagrams, and symbols may be used. In the student's answer booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

Fractional credit is *not* allowed. Only whole-number credit may be given to a response. Units need not be given when the wording of the questions allows such omissions.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw score should be converted to a scaled score by using the conversion chart that will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Wednesday, August 13, 2008. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination 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 18 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:

Cl<sup>-</sup>

sulfate

carbonate ion

any halide

sulfide

OH<sup>-</sup>

CrO<sub>4</sub><sup>2-</sup>

PO<sub>4</sub><sup>3-</sup>

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

Place the sample on a solid surface. Strike the sample with a hammer several times to see if the sample flattens.

Try to bend the sample to change the shape.

**53** [2] Allow a maximum of 2 credits, 1 credit for *each* acceptable response. Acceptable responses include, but are not limited to:

Increasing the temperature of the reaction causes the reacting particles to move faster and collide more frequently.

Increasing the concentration increases the number of particle collisions.

Increasing the surface area (solid reactant) allows a greater number of particles to collide.

Adding a catalyst provides an alternate way for the particles to react.

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

An atom of copper-63 has two fewer neutrons than an atom of copper-65.

An atom of Cu-63 has 34 neutrons and an atom of Cu-65 has 36 neutrons.

55 [1] Allow 1 credit for 29.

56 [1] Allow 1 credit for 5 *or* five.

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

$$(0.6917)(62.930 \text{ u}) + (0.3083)(64.928 \text{ u})$$

$$\frac{(69.17)(62.930) + (30.83)(64.928)}{100}$$

58 [1] Allow 1 credit for  $79^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . Significant figures do *not* need to be shown.

59 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

$$\frac{65.0 \text{ g} \mid 838 \text{ J}}{\mid 1 \text{ g}}$$

$$(65)(838)$$

- Allow 1 credit for  $5.45 \times 10^4 \text{ J}$  *or* 54 500 J *or* for a response consistent with the student's numerical setup. Significant figures do *not* need to be shown.

**Note:** Do *not* allow credit for a numerical setup and calculated result that are not related to the concept assessed by the question.



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

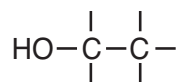
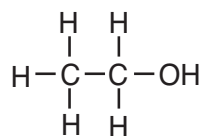
esterification

dehydration synthesis

**61** [1] Allow 1 credit for  $C_6H_{12}O_2$ . The order of the elements can vary.

**62** [1] Allow 1 credit.

**Examples of 1-credit responses:**



**63** [1] Allow 1 credit for  $\underline{\quad} \text{Mg(s)} + \underline{2} \text{HCl(aq)} \rightarrow \underline{\quad} \text{MgCl}_2\text{(aq)} + \underline{\quad} \text{H}_2\text{(g)}$ .

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

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

nonpolar covalent bond

covalent bond

nonpolar

65 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

$$V_2 = \frac{(99.5 \text{ kPa})(45.6 \text{ mL})(273 \text{ K})}{(293 \text{ K})(101.3 \text{ kPa})}$$

$$\frac{(99.5)(45.6)}{293} = \frac{(101.3)x}{273}$$

- Allow 1 credit for 41.7 mL *or* for a response consistent with the student's numerical setup. Significant figures do *not* need to be shown.

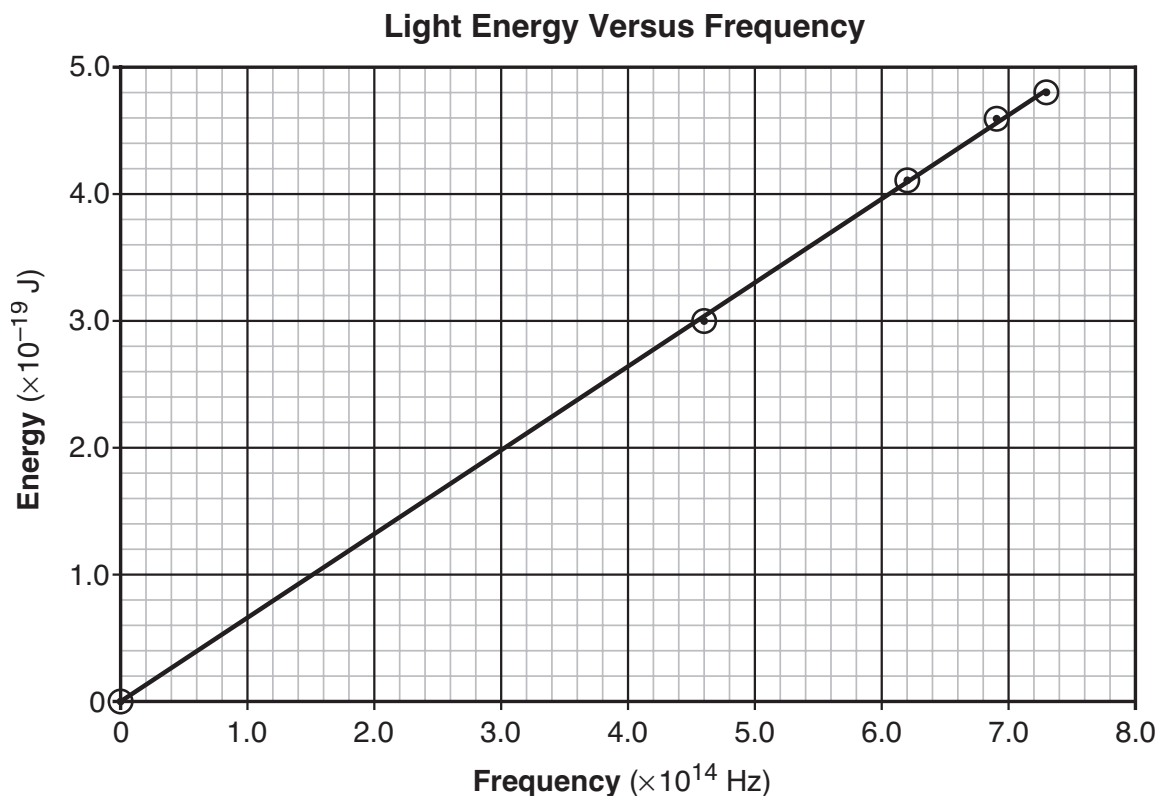
**Note:** Do *not* allow credit for a numerical setup and calculated result that are not related to the concept assessed by the question.

**Part C**

**Allow a total of 17 credits for this part. The student must answer all questions in this part.**

- 66** [1] Allow 1 credit for plotting all four points correctly  $\pm 0.3$  grid space. Plotted points do *not* need to be circled or connected.

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



- 67** [1] Allow 1 credit for  $1.5 \times 10^{-19} \text{ J} \pm 0.1 \times 10^{-19} \text{ J}$  or for a response consistent with the student's graph.

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

When the electron in a hydrogen atom moves from a higher energy state to a lower energy state, a specific amount of energy is emitted.

Light is emitted when electrons drop from higher electron shells to lower electron shells.

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

high temperature

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

In graphite, the electrons in the bonds between carbon atoms in different layers are only loosely held, but in diamond all of the electrons in the bonds are strongly held.

Graphite has electrons that can move more freely than the electrons in diamond.

71 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

$$V = \frac{m}{d} = \frac{0.200 \text{ g}}{3.51 \text{ g/cm}^3}$$

$$\frac{0.200 \text{ g}}{3.51 \text{ g}} \times 1 \text{ cm}^3$$

$$\frac{0.2}{3.51}$$

- Allow 1 credit for 0.0570 cm<sup>3</sup> *or* for a response consistent with the student's numerical setup. Significant figures do *not* need to be shown.

**Note:** Do *not* allow credit for a numerical setup and calculated result that are not related to the concept assessed by the question.

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

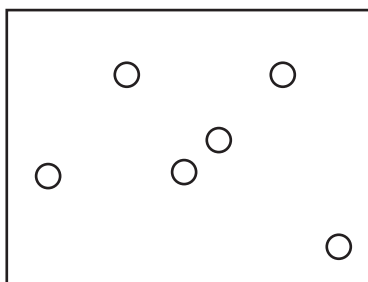
The boiling point of O<sub>3</sub> is 161 K, and the boiling point of O<sub>2</sub> is 90 K. Therefore, intermolecular forces between O<sub>3</sub> molecules are stronger than between O<sub>2</sub> molecules.

The intermolecular forces between oxygen molecules are weaker than those between molecules of ozone.

73 [1] Allow 1 credit for a diagram with *at least six* molecules drawn far apart and in a random arrangement.

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

Key
○ = propane molecule



74 [2] Allow a maximum of 2 credits, allocated as follows:

- Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

$$\text{mass} = (\text{number of moles}) (\text{gram molecular mass})$$

$$= (5.0 \text{ mol})((3)(12 \text{ g/mol}) + (8)(1 \text{ g/mol}))$$

$$5.0 \text{ mol} \times \frac{44 \text{ g}}{1.0 \text{ mol}}$$

$$(5)(44)$$

- Allow 1 credit for 220 g *or* for a response consistent with the student's numerical setup. Significant figures do *not* need to be shown.

**Note:** Do *not* allow credit for a numerical setup and calculated result that are not related to the concept assessed by the question.

75 [1] Allow 1 credit for 15 mol.

76 [1] Allow 1 credit for  $\text{Y}(\text{OH})_3$ .

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

$$\frac{0.055 \text{ g}}{250. \text{ g}} \times 100$$

$$\frac{0.055}{250} \times 100$$

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

Energy flows from the skin to the surroundings.

Heat is transferred from the skin to the water in sweat.

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

Charged particles are free to move when salts dissolve in water.

The ions in the salts dissociate and are free to move.

The salts form aqueous solutions that can conduct electric current.

80 [1] Allow 1 credit.

**Examples of 1-credit responses:**



**Note:** Do *not* accept a response that has dots around the element symbol.

## Regents Examination in Physical Setting/Chemistry

August 2008

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

***The Chart for Determining the Final Examination Score for the August 2008 Regents Examination in Physical Setting/Chemistry will be posted on the Department's web site <http://www.emsc.nysed.gov/osa/> on Wednesday, August 13, 2008. 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.***

### Submitting 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 [www.emsc.nysed.gov/osa/exameval](http://www.emsc.nysed.gov/osa/exameval).
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

<b>August 2008 Physical Setting/Chemistry</b>			
<b>Question Numbers</b>			
Key Ideas/Performance Indicators	Part A	Part B	Part C
<b>Standard 1</b>			
Math Key Idea 1		37, 43, 47, 56, 57, 59, 65	66, 67, 71, 73, 74, 76, 77
Math Key Idea 2		36, 43	
Math Key Idea 3		35, 47, 49, 59, 63, 65	71, 74, 75, 76
Science Inquiry Key Idea 1		53	68, 70, 72
Science Inquiry Key Idea 2		52	
Science Inquiry Key Idea 3		31, 32, 33, 41, 42, 43, 45, 46, 51, 58, 60, 61, 62	76, 79
Engineering Design Key Idea 1			
<b>Standard 2</b>			
Key Idea 1		51	68
Key Idea 2			
<b>Standard 6</b>			
Key Idea 1			78
Key Idea 2			69, 73
Key Idea 3			
Key Idea 4			
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, 37, 38, 39, 40, 45, 47, 53, 54, 55, 57, 60, 62, 63, 65	73, 74, 75, 77
Key Idea 4		44, 48, 49, 50, 59	
Key Idea 5		64	72, 80
<b>Standard 4</b>			
Key Idea 3	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29	31, 32, 33, 34, 35, 38, 39, 40, 41, 42, 43, 45, 46, 47, 51, 52, 53, 54, 55, 56, 57, 60, 61, 62, 63, 65	66, 67, 68, 69, 71, 73, 74, 75, 76, 77, 79
Key Idea 4	28, 30	37, 44, 48, 49, 50, 58, 59	78
Key Idea 5	10, 12, 13, 18	36, 64	70, 72, 80
ESRT 2001 Edition (Revised)	3, 4, 5, 6, 7, 8, 9, 10, 15, 19, 21, 25	31, 32, 33, 35, 36, 37, 39, 41, 43, 47, 48, 51, 55, 58, 59, 61, 62, 64, 65	69, 71, 72, 74, 76, 77, 80



## Regents Examination in Physical Setting/Chemistry August 2008

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

Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score	Raw Score	Scale Score
85	100	63	75	41	59	19	36
84	99	62	74	40	58	18	35
83	97	61	73	39	57	17	33
82	96	60	72	38	56	16	32
81	94	59	71	37	56	15	30
80	93	58	71	36	55	14	28
79	91	57	70	35	54	13	27
78	90	56	69	34	53	12	25
77	89	55	69	33	52	11	23
76	88	54	68	32	51	10	21
75	86	53	67	31	50	9	20
74	85	52	67	30	49	8	18
73	84	51	66	29	48	7	16
72	83	50	65	28	47	6	14
71	82	49	64	27	46	5	11
70	81	48	64	26	45	4	9
69	80	47	63	25	44	3	7
68	79	46	62	24	43	2	5
67	78	45	62	23	41	1	2
66	77	44	61	22	40	0	0
65	76	43	60	21	39		
64	75	42	59	20	38		

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Final Score" on the student's answer sheet.

All student answer papers that receive a scale score of 60 through 64 **must** be scored a second time to ensure the accuracy of the score. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate and reliable scoring of the student's answer paper.

Because scale scores corresponding to raw scores in the conversion chart change from one examination 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. The chart above is usable only for this administration of the Physical Setting/Chemistry Examination.