The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Tuesday, August 16, 2005 — 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*.

1 Which subatomic particle has a negative charge?

(1) proton
(2) electron
(3) neutron
(4) positron

2 Which statement best describes the nucleus of an aluminum atom?

(1) It has a charge of +13 and is surrounded by a total of 10 electrons.
(2) It has a charge of +13 and is surrounded by a total of 13 electrons.
(3) It has a charge of –13 and is surrounded by a total of 10 electrons.
(4) It has a charge of –13 and is surrounded by a total of 13 electrons.

3 The atomic mass of an element is the weighted average of the

(1) number of protons in the isotopes of that element
(2) number of neutrons in the isotopes of that element
(3) atomic numbers of the naturally occurring isotopes of that element
(4) atomic masses of the naturally occurring isotopes of that element

4 In which pair do the particles have approximately the same mass?

(1) proton and electron
(2) proton and neutron
(3) neutron and electron
(4) neutron and beta particle

5 Two different samples decompose when heated. Only one of the samples is soluble in water. Based on this information, these two samples are

(1) both the same element
(2) two different elements
(3) both the same compound
(4) two different compounds

6 The elements located in the lower left corner of the Periodic Table are classified as

(1) metals
(2) nonmetals
(3) metalloids
(4) noble gases

7 Which of these elements has the *lowest* melting point?

(1) Li
(2) Na
(3) K
(4) Rb

8 Which list consists of elements that have the most similar chemical properties?

(1) Mg, Al, and Si
(2) Mg, Ca, and Ba
(3) K, Al, and Ni
(4) K, Ca, and Ga

9 The correct chemical formula for iron(II) sulfide is

(1) FeS
(2) Fe_2S_3
(3) $FeSO_4$
(4) $Fe_2(SO_4)_3$

10 Which list consists of types of chemical formulas?

(1) atoms, ions, molecules
(2) metals, nonmetals, metalloids
(3) empirical, molecular, structural
(4) synthesis, decomposition, neutralization

11 Which type of bonding is found in all molecular substances?

(1) covalent bonding
(2) hydrogen bonding
(3) ionic bonding
(4) metallic bonding

12 An aqueous solution of sodium chloride is best classified as a

(1) homogeneous compound
(2) homogeneous mixture
(3) heterogeneous compound
(4) heterogeneous mixture

13 What is the total number of electrons shared in a double covalent bond between two atoms?

(1) 1
(2) 2
(3) 8
(4) 4

14 Which formula represents a nonpolar molecule?

(1) H_2S
(2) HCl
(3) CH_4
(4) NH_3

15 What occurs when an atom loses an electron?

(1) The atom's radius decreases and the atom becomes a negative ion.
(2) The atom's radius decreases and the atom becomes a positive ion.
(3) The atom's radius increases and the atom becomes a negative ion.
(4) The atom's radius increases and the atom becomes a positive ion.

16 Two samples of gold that have different temperatures are placed in contact with one another. Heat will flow spontaneously from a sample of gold at 60°C to a sample of gold that has a temperature of

(1) 50°C
(2) 60°C
(3) 70°C
(4) 80°C

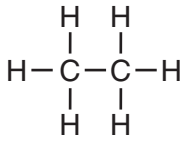
17 Under which conditions of temperature and pressure would helium behave most like an ideal gas?

(1) 50 K and 20 kPa
(2) 50 K and 600 kPa
(3) 750 K and 20 kPa
(4) 750 K and 600 kPa

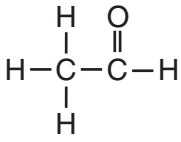
18 A sample of oxygen gas is sealed in container *X*. A sample of hydrogen gas is sealed in container Z. Both samples have the same volume, temperature, and pressure. Which statement is true?

(1) Container *X* contains more gas molecules than container Z.
(2) Container *X* contains fewer gas molecules than container Z.
(3) Containers *X* and *Z* both contain the same number of gas molecules.
(4) Containers *X* and *Z* both contain the same mass of gas.

19 Which formula represents an unsaturated hydrocarbon?



(1)



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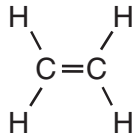

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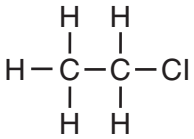
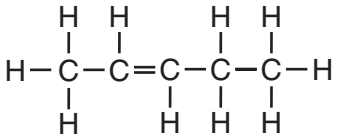


(4)

20 Given the formula:



What is the IUPAC name of this compound?

(1) 2-pentene
(2) 2-pentyne
(3) 2-butene
(4) 2-butyne

21 Given the reaction system in a closed container at equilibrium and at a temperature of 298 K:

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

The measurable quantities of the gases at equilibrium must be

(1) decreasing
(2) increasing
(3) equal
(4) constant

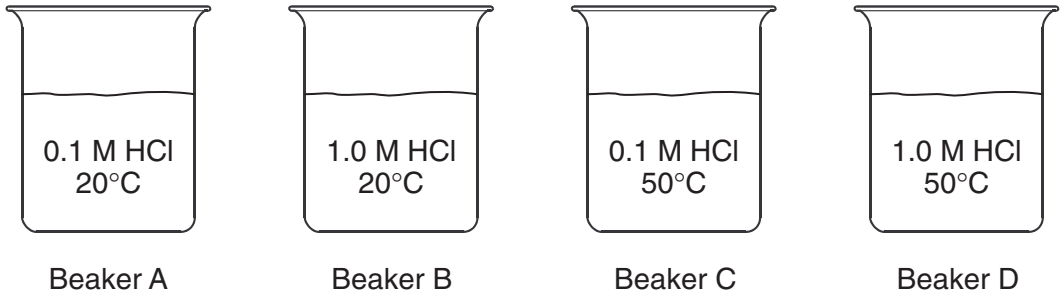
22 Atoms of which element can bond with each other to form ring and chain structures in compounds?

(1) C
(2) Ca
(3) H
(4) Na

23 In a voltaic cell, chemical energy is converted to

(1) electrical energy, spontaneously
(2) electrical energy, nonspontaneously
(3) nuclear energy, spontaneously
(4) nuclear energy, nonspontaneously

24 In each of the four beakers shown below, a 2.0-centimeter strip of magnesium ribbon reacts with 100 milliliters of HCl(aq) under the conditions shown.



In which beaker will the reaction occur at the fastest rate?

(1) *A*
(2) *B*
(3) *C*
(4) *D*

25 Which aqueous solution is the best conductor of an electrical current?

(1) 0.01 M CH_3OH
(2) 0.01 M KOH
(3) 0.1 M CH_3OH
(4) 0.1 M KOH

26 A hydrogen ion, H^+, in aqueous solution may also be written as

(1) H_2O
(2) H_2O_2
(3) H_3O^+
(4) OH^-

27 One acid-base theory states that an acid is

(1) an electron donor
(2) a neutron donor
(3) an H^+ donor
(4) an OH^- donor

28 Which isotope will spontaneously decay and emit particles with a charge of +2?

(1) ^{53}Fe
(2) ^{137}Cs
(3) ^{198}Au
(4) ^{220}Fr

29 Radioactive cobalt-60 is used in radiation therapy treatment. Cobalt-60 undergoes beta decay. This type of nuclear reaction is called

(1) natural transmutation
(2) artificial transmutation
(3) nuclear fusion
(4) nuclear fission

Note that question 30 has only three choices.

30 Given the balanced ionic equation:

$$2Al(s) + 3Cu^{2+}(aq) \rightarrow 2Al^{3+}(aq) + 3Cu(s)$$

Compared to the total charge of the reactants, the total charge of the products is

(1) less
(2) greater
(3) the same

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 The percentage by mass of Br in the compound $AlBr_3$ is closest to

(1) 10.%
(2) 25%
(3) 75%
(4) 90.%

32 Which symbol represents a particle with a total of 10 electrons?

(1) N
(2) N^{3+}
(3) Al
(4) Al^{3+}

33 Which electron configuration represents an atom of aluminum in an excited state?

(1) 2-7-4
(2) 2-7-7
(3) 2-8-3
(4) 2-8-6

34 At STP, an element that is a brittle solid and a poor conductor of heat and electricity could have an atomic number of

(1) 12
(2) 13
(3) 16
(4) 17

35 Based on Reference Table *S*, atoms of which of these elements have the strongest attraction for the electrons in a chemical bond?

(1) Al
(2) Si
(3) P
(4) S

36 A sample of a compound contains 65.4 grams of zinc, 12.0 grams of carbon, and 48.0 grams of oxygen. What is the mole ratio of zinc to carbon to oxygen in this compound?

(1) 1:1:2
(2) 1:1:3
(3) 1:4:6
(4) 5:1:4

37 Which process would most effectively separate two liquids with different molecular polarities?

(1) filtration
(2) fermentation
(3) distillation
(4) conductivity

38 Given the balanced equation:

$AgNO_3(aq) + NaCl(aq) \rightarrow NaNO_3(aq) + AgCl(s)$

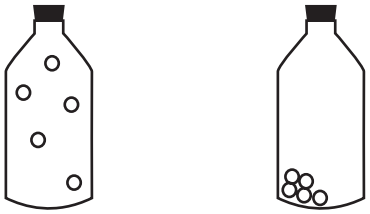
This reaction is classified as

(1) synthesis
(2) decomposition
(3) single replacement
(4) double replacement

39 A solution contains 35 grams of KNO_3 dissolved in 100 grams of water at 40°C. How much *more* KNO_3 would have to be added to make it a saturated solution?

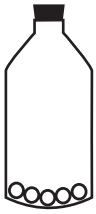
(1) 29 g
(2) 24 g
(3) 12 g
(4) 4 g

40 Which diagram best represents a gas in a closed container?



(1)

(3)



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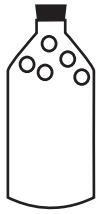
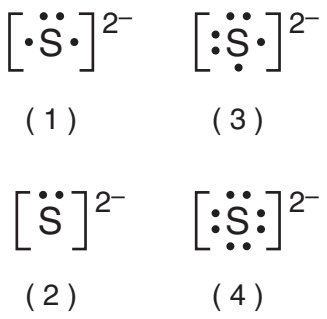


(4)

41 What is the total number of moles of NaCl(s) needed to make 3.0 liters of a 2.0 M NaCl solution?

(1) 1.0 mol
(2) 0.70 mol
(3) 6.0 mol
(4) 8.0 mol

42 Which Lewis electron-dot diagram is correct for a S^{2-} ion?



(1) (3)

(2) (4)

43 A student wants to prepare a 1.0-liter solution of a specific molarity. The student determines that the mass of the solute needs to be 30. grams. What is the proper procedure to follow?

(1) Add 30. g of solute to 1.0 L of solvent.
(2) Add 30. g of solute to 970. mL of solvent to make 1.0 L of solution.
(3) Add 1000. g of solvent to 30. g of solute.
(4) Add enough solvent to 30. g of solute to make 1.0 L of solution.

44 What is the total number of joules released when a 5.00-gram sample of water changes from liquid to solid at 0°C?

(1) 334 J (3) 2260 J
(2) 1670 J (4) 11 300 J

45 Which set of procedures and observations indicates a chemical change?

(1) Ethanol is added to an empty beaker and the ethanol eventually disappears.
(2) A solid is gently heated in a crucible and the solid slowly turns to liquid.
(3) Large crystals are crushed with a mortar and pestle and become powder.
(4) A cool, shiny metal is added to water in a beaker and rapid bubbling occurs.

46 At STP, a sample of which element has the highest entropy?

(1) Na(s) (3) $Br_2(\ell)$
(2) $Hg(\ell)$ (4) $F_2(g)$

47 Given the incomplete equation representing an organic addition reaction:

$$X(g) + Cl_2(g) \rightarrow XCl_2(g)$$

Which compound could be represented by *X*?

(1) CH_4 (3) C_3H_8
(2) C_2H_4 (4) C_4H_{10}

48 Given the incomplete equation:

$$4Fe + 3O_2 \rightarrow 2X$$

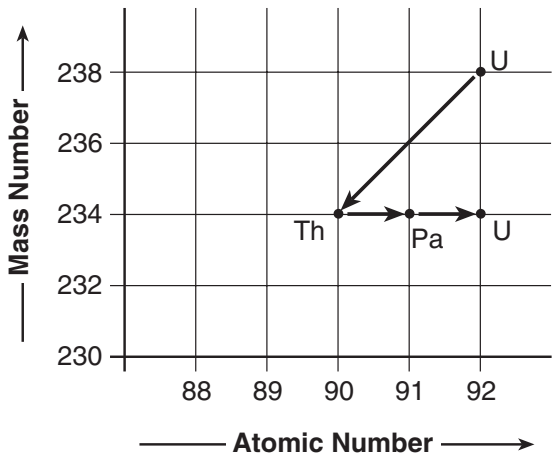
Which compound is represented by *X*?

(1) FeO (3) Fe_3O_2
(2) Fe_2O_3 (4) Fe_3O_4

49 How are $HNO_3(aq)$ and $CH_3COOH(aq)$ similar?

(1) They are Arrhenius acids and they turn blue litmus red.
(2) They are Arrhenius acids and they turn red litmus blue.
(3) They are Arrhenius bases and they turn blue litmus red.
(4) They are Arrhenius bases and they turn red litmus blue.

50 The chart below shows the spontaneous nuclear decay of U-238 to Th-234 to Pa-234 to U-234.



What is the correct order of nuclear decay modes for the change from U-238 to U-234?

(1) β^- decay, γ decay, β^- decay
(2) β^- decay, β^- decay, α decay
(3) α decay, α decay, β^- decay
(4) α decay, β^- decay, β^- decay

Part B–2

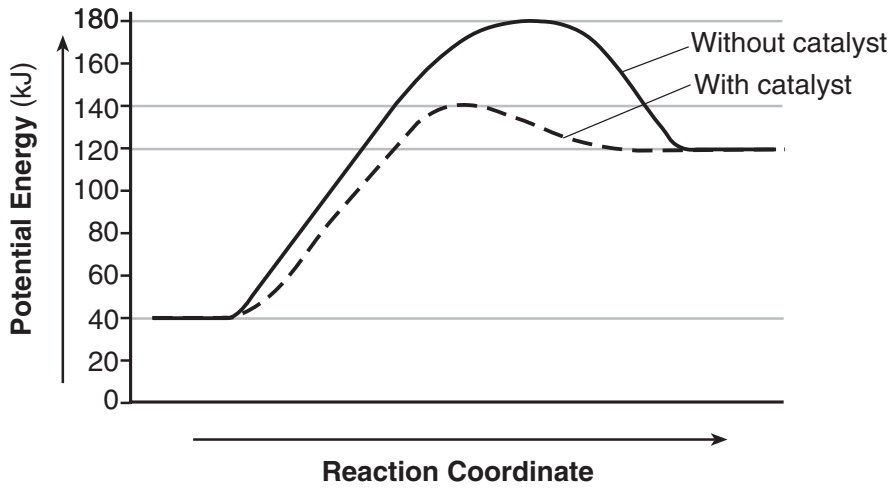
Answer all questions in this part.

Directions (51–67): 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 In the space *in your answer booklet,* show a correct numerical setup for calculating the formula mass of glucose, $C_6H_{12}O_6$. [1]

52 Write the empirical formula for the compound $C_6H_{12}O_6$. [1]

Base your answers to questions 53 through 55 on the potential energy diagram below.



53 What is the heat of reaction for the forward reaction? [1]

54 What is the activation energy for the forward reaction with the catalyst? [1]

55 Explain, in terms of the function of a catalyst, why the curves on the potential energy diagram for the catalyzed and uncatalyzed reactions are different. [1]

Base your answers to questions 56 through 58 on the properties of propanone.

56 In the space *in your answer booklet,* draw the structural formula for propanone. [1]

57 Explain, in terms of molecular energy, why the vapor pressure of propanone increases when its temperature increases. [1]

58 A liquid's boiling point is the temperature at which its vapor pressure is equal to the atmospheric pressure. Using Reference Table *H,* what is the boiling point of propanone at an atmospheric pressure of 70 kPa? [1]

Base your answers to questions 59 through 61 on the information below.

Two isotopes of potassium are K-37 and K-42.

59 What is the total number of neutrons in the nucleus of a K-37 atom? [1]

60 How many valence electrons are in an atom of K-42 in the ground state? [1]

61 Explain, in terms of subatomic particles, why K-37 and K-42 are isotopes of potassium. [1]

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62 A sample of oxygen gas in one container has a volume of 20.0 milliliters at 297 K and 101.3 kPa. The entire sample is transferred to another container where the temperature is 283 K and the pressure is 94.6 kPa. In the space *in your answer booklet,* show a correct numerical setup for calculating the new volume of this sample of oxygen gas. [1]

63 In the space *in your answer booklet,* draw a Lewis electron-dot diagram for a molecule of phosphorus trichloride, PCl_3. [1]

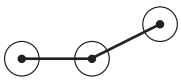
Base your answers to questions 64 through 67 on the table below.

First Ionization Energy of Selected Elements

Element	Atomic Number	First Ionization Energy (kJ/mol)
lithium	3	520
sodium	11	496
potassium	19	419
rubidium	37	403
cesium	55	376

64 On the grid *in your answer booklet,* mark an appropriate scale on the axis labeled "First Ionization Energy (kJ/mol)." An appropriate scale is one that allows a trend to be seen. [1]

65 On the same grid, plot the data from the table. Circle and connect the points. [1]

Example: 

66 State the trend in first ionization energy for the elements in the table as the atomic number increases. [1]

67 Explain, in terms of atomic structure, why cesium has a *lower* first ionization energy than rubidium. [1]

Part C

Answer all questions in this part.

Directions (68–85): 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 68 through 70 on the information below.

The decomposition of sodium azide, $NaN_3(s)$, is used to inflate airbags. On impact, the $NaN_3(s)$ is ignited by an electrical spark, producing $N_2(g)$ and Na(s). The $N_2(g)$ inflates the airbag.

68 Balance the equation *in your answer booklet,* using the smallest whole-number coefficients. [1]

69 What is the total number of moles present in a 52.0-gram sample of $NaN_3(s)$ (gram-formula mass = 65.0 gram/mole)? [1]

70 An inflated airbag has a volume of 5.00×10^4 cm^3 at STP. The density of $N_2(g)$ at STP is 0.00125 g/cm^3. What is the total number of grams of $N_2(g)$ in the airbag? [1]

Base your answers to questions 71 through 73 on the information below.

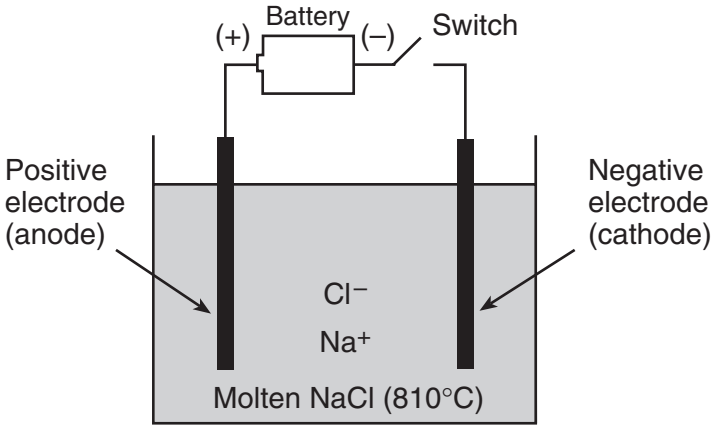
Element *X* is a solid metal that reacts with chlorine to form a water-soluble binary compound.

71 State *one* physical property of element *X* that makes it a good material for making pots and pans. [1]

72 Explain, in terms of particles, why an aqueous solution of the binary compound conducts an electric current. [1]

73 The binary compound consists of element *X* and chlorine in a 1:2 molar ratio. What is the oxidation number of element *X* in this compound? [1]

Base your answers to questions 74 through 76 on the diagram and balanced equation below, which represent the electrolysis of molten NaCl.



$$2NaCl \longrightarrow Cl_2 + 2Na$$

74 When the switch is closed, which electrode will attract the sodium ions? [1]

75 What is the purpose of the battery in this electrolytic cell? [1]

76 Write the balanced half-reaction for the reduction that occurs in this electrolytic cell. [1]

Base your answers to questions 77 through 79 on the information below.

In a titration, 3.00 M NaOH(aq) was added to an Erlenmeyer flask containing 25.00 milliliters of HCl(aq) and three drops of phenolphthalein until one drop of the NaOH(aq) turned the solution a light-pink color. The following data were collected by a student performing this titration.

Initial NaOH(aq) buret reading: 14.45 milliliters

Final NaOH(aq) buret reading: 32.66 milliliters

77 What is the total volume of NaOH(aq) that was used in this titration? [1]

78 In the space *in your answer booklet,* show a correct numerical setup for calculating the molarity of the HCl(aq). [1]

79 Based on the data given, what is the correct number of significant figures that should be shown in the molarity of the HCl(aq)? [1]

Base your answers to questions 80 through 82 on the information below.

A student was studying the pH differences in samples from two Adirondack streams. The student measured a pH of 4 in stream *A* and a pH of 6 in stream *B*.

80 Compare the hydronium ion concentration in stream *A* to the hydronium ion concentration in stream *B*. [1]

81 What is the color of bromthymol blue in the sample from stream *A*? [1]

82 Identify *one* compound that could be used to neutralize the sample from stream *A*. [1]

Base your answers to questions 83 through 85 on the information below.

The radioisotopes carbon-14 and nitrogen-16 are present in a living organism. Carbon-14 is commonly used to date a once-living organism.

83 Complete the nuclear equation *in your answer booklet* for the decay of C-14. Include *both* the atomic number and the mass number of the missing particle. [1]

84 Explain why N-16 is a poor choice for radioactive dating of a bone. [1]

85 A sample of wood is found to contain $\frac{1}{8}$ as much C-14 as is present in the wood of a living tree. What is the approximate age, in years, of this sample of wood? [1]

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Tuesday, August 16, 2005 — 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

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

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

Tear Here

Tear Here

PS/CHEMISTRY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Tuesday, August 16, 2005 — 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	17	
C	18	

Total Written Test Score (Maximum Raw Score: 85) ☐

Final Score (from conversion chart) ☐

Raters' Initials:

Rater 1 ..... **Rater 2** .....

For Raters Only

Part B–2

51

51 ☐

52 _____ **52** ☐

53 _____ **kJ** **53** ☐

54 _____ **kJ** **54** ☐

55 _____

_____ **55** ☐

_____

For Raters Only

56

56 ☐

57 _____

_____ **57** ☐

_____

58 _____ **°C** **58** ☐

59 _____ **59** ☐

60 _____ **60** ☐

61 _____

_____ **61** ☐

_____

For Raters Only

62

62

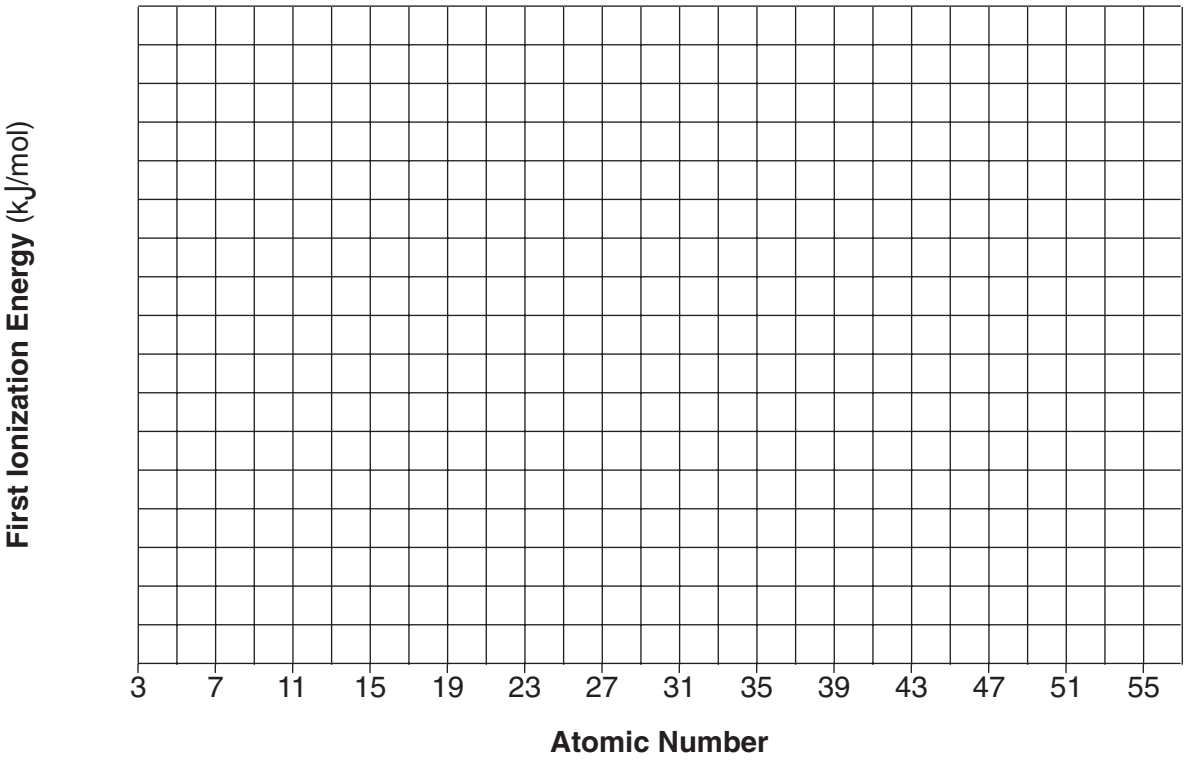
63

63

For Raters Only

64 and 65

First Ionization Energy Versus Atomic Number of Selected Elements



64 ☐

65 ☐

66 _____

_____

66 ☐

67 _____

_____

67 ☐

_____

Total Score for Part B–2

Part C

For Raters Only

68 _____ $NaN_3(s) \rightarrow$ _____ $Na(s) +$ _____ $N_2(g)$ **68** ☐

69 _____ **mol** **69** ☐

70 _____ **g** **70** ☐

71 _____ **71** ☐

72 _____

_____ **72** ☐

_____

73 _____ **73** ☐

74 _____ **74** ☐

75 _____

75 ☐

_____

76 _____ **76** ☐

For Raters Only

77 _____ **mL** **77** ☐

78 **78** ☐

79 _____ **79** ☐

80 _____ **80** ☐

_____

81 _____ **81** ☐

82 _____ **82** ☐

83 $^{14}_{6}\mathrm{C} \rightarrow$ _____ $+ {}^{0}_{-1}\mathrm{e}$ **83** ☐

84 _____ **84** ☐

_____

_____

85 _____ **y** **85** ☐

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

Tuesday, August 16, 2005 — 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. Visit the site http://www.emsc.nysed.gov/osa/ and select the link "Latest Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and at least one more time before the final scores for the examination are recorded.

Part A and Part B–1
Allow 1 credit for each correct response.

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

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 checkmark 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 Tuesday, August 16, 2005. 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 17 credits for this part. The student must answer all questions in this part.

51 [1] Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

6(12.0) + 12(1.0) + 6(16.0)

6(12) + 12(1) + 6(16)

52 [1] Allow 1 credit for CH_2O. The order of the elements can vary.

53 [1] Allow 1 credit for +80 kJ or 80 kJ.

54 [1] Allow 1 credit for +100 kJ or 100 kJ.

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

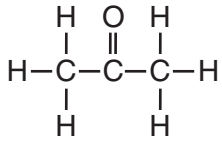
A catalyst provides an alternate reaction pathway that has a lower activation energy than an uncatalyzed reaction.

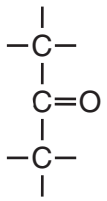
A catalyst speeds up the reaction.

lower activation energy

56 [1] Allow 1 credit.

Examples of 1-Credit Responses





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

As the temperature increases, more molecules have enough energy to escape the liquid phase.

58 [1] Allow 1 credit for 45°C (±2).

59 [1] Allow 1 credit for 18.

60 [1] Allow 1 credit for 1 or one.

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

same number of protons, different number of neutrons

K-37 has fewer neutrons than K-42.

same element; different number of neutrons

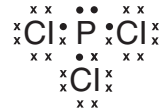
62 [1] Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

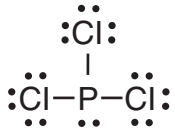
$$V_2 = \frac{(20.0\text{ mL})(101.3\text{ kPa})(283\text{ K})}{(94.6\text{ kPa})(297\text{ K})}$$

$$\frac{(101.3)(20.0)}{297} = \frac{(94.6)V_2}{283}$$

63 [1] Allow 1 credit. The angle of atom arrangements may vary.

Examples of 1-Credit Responses



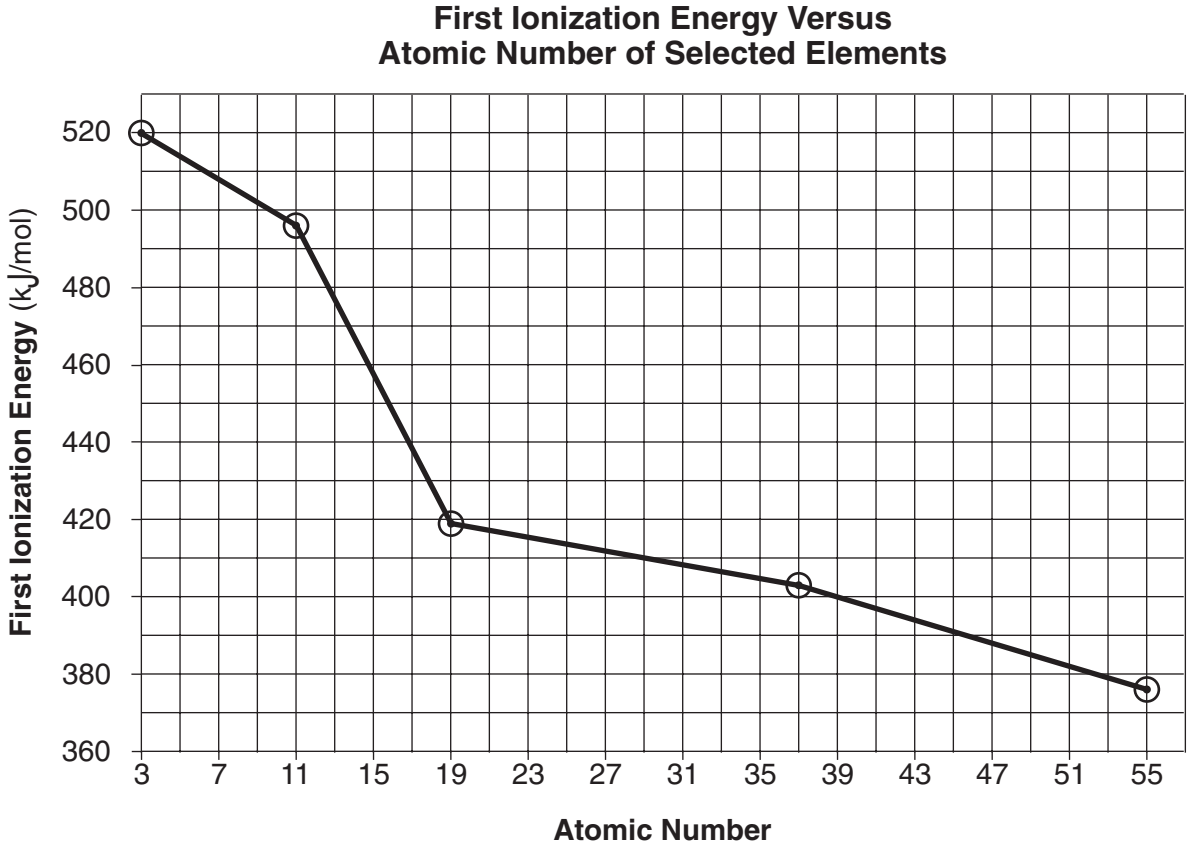


64 [1] Allow 1 credit for marking an appropriate linear scale. An appropriate scale is one that allows a trend to be seen.

65 [1] Allow 1 credit for plotting all the points correctly (±0.3 grid space). Plotted points do *not* need to be circled or connected.

64 and 65

Example of a 2-Credit Graph for Questions 64 and 65



66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

As atomic number increases, first ionization energy decreases.

Ionization energy decreases.

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

As atomic radius increases, valence electrons are more easily removed.

The force of attraction between the nucleus and the valence electrons decreases down the group.

cesium has more shells, easier to remove electrons

Part C

Allow a total of 18 credits for this part. The student must answer all questions in this part.

68 [1] Allow 1 credit for **2** $NaN_3(s) \rightarrow$ **2** $Na(s) +$ **3** $N_2(g)$.

69 [1] Allow 1 credit. Significant figures do *not* need to be shown. Acceptable responses include, but are not limited to:

0.800 mol

70 [1] Allow 1 credit. Significant figures do *not* need to be shown. Acceptable responses include, but are not limited to:

62.5 g

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

conducts heat

high melting point

It is malleable.

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

The aqueous solution has mobile ions.

Charged particles can move in water.

73 [1] Allow 1 credit for +2 or 2 or two.

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

negative electrode

cathode

one on the right

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

Electrolytic cells require energy.

The battery forces the nonspontaneous reaction to occur.

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

$Na^+ + e^- \rightarrow Na$

$2Na^+ + 2e^- \rightarrow 2Na$

77 [1] Allow 1 credit for 18.21 mL.

78 [1] Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

$$M_A = \frac{(3.00\ \text{M})(18.21\ \text{mL})}{25.00\ \text{mL}}$$

$M_A(25) = (3)(18.21)$

or

Allow 1 credit for a numerical setup consistent with the student's response to question 77.

79 [1] Allow 1 credit for 3 or three.

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

Stream *A* has more hydronium ions.

Stream *B* has a lower concentration.

A is higher.

100 times higher

81 [1] Allow 1 credit for yellow.

82 [1] Allow 1 credit. Also allow credit for a correctly written chemical formula of an acceptable compound. Acceptable responses include, but are not limited to:

sodium hydroxide

lime

NH_3

any base

83 [1] Allow 1 credit for $^{14}_{7}N$.

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

The half-life of N-16 is too short.

decays too fast

Too little N-16 remains in the sample.

85 [1] Allow 1 credit for a correct numerical setup. Acceptable responses include, but are not limited to:

17 190 y

3(5730) y

The *Chart for Determining the Final Examination Score for the August 2005 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site http://www.emsc.nysed.gov/osa/ on Tuesday, August 16, 2005. 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.

Map to Core Curriculum

August 2005 Physical Setting/ Chemistry			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		41,58,64,65	70,78,79
Math Key Idea 2			
Math Key Idea 3		31,36,41	
Sci. Inq. Key Idea 1		61	
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3		50,58	73,74,82,84
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			
Key Idea 3			80
Key Idea 4			
Key Idea 5		58	
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		32,33,34,35,37, 38,39,40,41,43, 45,46,47,48,49, 51,52,56,59,60, 61,62,66,67	68,69,71,72,75, 76,77,78,81
Key Idea 4		44,53,54,55,57	83,85
Key Idea 5		42,57,58,63	
Standard 4			
Key Idea 3	1,2,3,4,5,6,7,8, 9,10,12,17,18, 19,20,21,22,23, 24,25,26,27,28, 30	31,32,33,34,35, 36,37,38,39,40, 41,43,45,46,47, 48,49,50,51,52, 56,59,60,61,62, 64,65,66,67	68,69,70,71,72, 73,74,75,76,77, 78,79,80,81,82
Key Idea 4	16,29	44,53,54,55,57	83,84,85
Key Idea 5	7,11,13,14,15	42,58,63	72
Reference Tables			
2002 Edition	1,2,4,6,7,8,9, 19,20,28	31,32,33,34,35, 36,39,42,43,44, 47,48,49,50,51, 56,57,58,59,60, 61,62,63	73,76,78,81,82, 83,84,85

University of the State of New York
State Education Department

Regents Examination in Physical Setting / Chemistry
August 2005

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

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	63	75	41	60	19	39
84	98	62	74	40	59	18	37
83	97	61	74	39	58	17	36
82	95	60	73	38	57	16	34
81	94	59	72	37	57	15	33
80	93	58	71	36	56	14	31
79	91	57	71	35	55	13	29
78	90	56	70	34	54	12	28
77	89	55	69	33	53	11	26
76	88	54	68	32	53	10	24
75	87	53	68	31	52	9	22
74	85	52	67	30	51	8	20
73	84	51	66	29	50	7	18
72	83	50	66	28	49	6	16
71	82	49	65	27	48	5	13
70	81	48	64	26	47	4	11
69	80	47	64	25	46	3	8
68	79	46	63	24	45	2	5
67	79	45	62	23	44	1	2
66	78	44	62	22	42	0	0
65	77	43	61	21	41		
64	76	42	60	20	40		

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 scaled score that corresponds to that raw score. The scaled 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 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. The chart above is usable only for this administration of the physical setting / chemistry examination.